"FACTORS INFLUENCING NUTRITIONAL STATUS OF SCHOOL CHILDREN (5-14 YEARS) IN KIBERA LOCATION, NAIROBI"

BY

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DECLARATION

I hereby declare that this thesis is my own original work and has not been presented for examination in any other University.

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DEDICATION

I dedicate this thesis to my husband Julius Bett; children Kathleen, Kimberly, and Adrian; and parents Mr. & Mrs. B.K. Tai.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

OPERATIONAL DEFINITIONS

Access to safe water: Daily provision of 50 litres of water, at least per household within a distance of one kilometre from the residence

Access to toilet facility: At least having a toilet to use, either own or shared toilet.

Body Mass Index (BMI): Is a number calculated from a child's weight and height and it's an indicator for body fatness for most children and teens given by: $\{\text{Weight (kg)} / \text{Height (cm)}^2\}$

Children of school age: Those children who were aged 5-14 years

Nutritional status: State of the body in relation to the consumption and utilization of nutrients as assessed using anthropometric indicators.

Household: All individuals living in the same dwelling, answerable to the same head and sharing a common source of food and income.

Income: Is the sum of all wages, salaries, profits, money received for rent, and other forms of earnings received per month.

Sanitation: Having facilities and services for the safe disposal of human urine and faeces and maintenance of hygienic conditions.

School children: Children between ages 5-14 years and attending school (primary school children).

Height for age: An indicator of nutritional status that was used to monitor growth of children and indicate chronic malnutrition. The height of the school child under study was compared with the height of a standard child of the same age. The cut-off point was height for age < -2 Z scores (WHO child growth standards 2005).

Weight for age: An indicator of nutritional status that is used to monitor growth of children and indicate chronic or acute malnutrition. The weight of the child under study is compared with the weight of a standard child of the same age. The cut-off point was weight for age < -2 Z scores

Weight for height: A nutritional indicator that gives information on the present nutritional status and indicates whether a child suffers from acute malnutrition. The weight of the child under study is compared with the weight of a standard child of the same height. The cut-off point was weight for height < - 2 Z scores

Z scores: Used to measure the deviation of the anthropometric value for an individual child from the median value of reference population (National Centre for Health and Statistics of the United States of America).

ABBREVIATIONS

ACC/SCN:	Administrative Committee on Coordination in the sub-Committee on Nutrition
BMI	Body mass index
BSN	Bachelor of Science in Nursing
CBS	Central Bureau of Statistics
CI	Confidence interval
EPI INFO	Epidemiological Information
FANTA	Food and Nutrition Technical Assistance
GIT	Gastro intestinal tract
HIV/ AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
NGO	Non Governmental Organization
IFPRI	International Food Policy Research Institute
IOTF	International Obesity Task Force
KDHS	Kenya Demographic and Health Survey
NCHS	National Centre for Health and Statistics of the United States of America
OR	Odds Ratio
SCN	Standing Committee on Nutrition
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UON	University of Nairobi
UNICEF	United Nations Children's Fund
URTI	Upper Respiratory Tract Infection
WHO	World Health Organization

ABSTRACT

Malnutrition is a major public health problem in Kenya. Fifty four percent of the children under five years are malnourished out of which 30.6% are stunted, 4.8% are wasted, and 19.1% are underweight (CBS, MOH and ORC. Macro 2004). In view of the scale of the problem in children under five years, nutritional programmes in Kenya since independence have focused on this age group. However, malnutrition is a significant problem in older children as well, a fact that is often overlooked by policy makers and program managers (Kapoor et al 1999). This is despite the fact that malnutrition in children under five years does not disappear magically when children cross the 'critical' threshold of five years because there are many factors influencing their nutritional status.

The aim of this study was to establish factors influencing the nutritional status of school children in Kieran Location, Nairobi. This was a descriptive cross sectional study conducted in the four villages of Kieran Location, namely, Makina, Silanga, Kieran, and Lindi. Multi-stage random sampling was used to select the study location. A pre-tested structured questionnaire was used to collect data from 432 randomly selected households. The questionnaire focused on socio-demographic, environmental, and food security factors of the households and the frequency of food intake. In these households, anthropometric measurements of the youngest school child between 5 and 14 years of age were also taken using a Standiometer and Salter weighing scale.

The nutritional status of the school children was assessed using anthropometric indicators of body mass index (BMI for age), weight-for-age (wt/age), and height-for-age (ht/age). The data were entered and analyzed by use of SPSS version 11 and EPI info version 3.4.3 2007 Nutristat packages, and STRATA version 9.

A total of 432 children in the age range of 5-14 years were assessed. Out of the group studied, 44% were males and 56% were females. The prevalence of stunting among the children was 35%; prevalence of underweight was 26.0%: prevalence of thinnessxv

was14.8 %, prevalence of overweight 7.1%; and obese was 6.3%. Girls were more affected than boys. Younger children who were ages 5-7 years were also more affected.

Results of the bivariate analysis showed that many variables were significant but after subjecting the data to logistic regression analysis to eliminate confounding factors, it was found that only the care givers' level of education ($p = 0.003$) and consumption of less than three meals per day were significant ($p = 0.035$) factors affecting the nutritional status of the school children who were underweight. Eating less than three meals per day ($p = 0.031$) was found to prevent overweight in the school children.

The main factors found to have a significant effect on the nutritional status of the school children were the alternate care giver's level of education, and food consumption and frequency patterns (particularly the frequency of meals per day). The study recommended that efforts directed towards education of the alternate care giver and frequency of meal intake per day would have a positive impact on the nutritional status of school children in the study area.

CHAPTER ONE: INTRODUCTION

1.1 Background

Malnutrition is a worldwide problem that is especially severe in developing countries where over a quarter of the children below five years are severely stunted. In Africa, more than a third of the children below five years are stunted with the level of stunting exceeding 44 percent in East Africa (Maxwell 2005). In Kenya, nearly half of the children below five years are unable to grow to their full physical and mental potential owing to malnutrition, which is caused by more complex social and behavioural determinants in addition to the immediate and underlying factors like poverty, inadequate health services, poor maternal health and child care practices, inadequate water and sanitation, and insufficient food security that affect child feeding and rearing (CBS, MOH and ORC. Macro 2004).

Child survival programmes have successfully reduced the infant and child mortality rate by half and the number of children eligible to enter school has increased by 10 million per year to just below 800 million. Approximately 25 percent of these children remain undernourished (Galal et al 2005). Lack of proper nutrition is one of the reasons why an estimated 115 million school children around the world are out of primary school and many of these children may also be suffering from micronutrient deficiencies or lack of essential vitamins and minerals (UNICEF 2006).

In Kenya, about 10 million or 28.7 percent of the country's 37 million people comprises children aged 5-14 years with school children making up a sizeable proportion of this age group (CBS, MOH and ORC. Macro 2004). Primary school education in Kenya has expanded drastically since independence. Data from the Ministry of Education, Science and Technology indicates that the gross primary school enrolment ratio was at a peak of 100 percent in 1989 but had declined to only 88 percent by 2002 due to cost sharing before rising again to 104 percent in 2003 with the implementation of the "free primary education" policy (Mwiria 2005).

A study done by Galal et al (2008) showed that despite an increase in school enrolment, Nairobi lagged behind most parts of the country with a low enrolment rate of 62 percent. The study also revealed that majority of the urban poor, who are meant to benefit from the free primary education programme, were enrolling their children in cost-incurring informal schools. Another study revealed the lack of a mechanism linking these informal schools to secondary schools and consequently students from informal schools were unable to attain secondary education upon completion of primary school (APHRC 2002).

The continuing poor health and nutritional status of many of the world's school-age children causes poor growth and other negative consequences. There is growing concern that nutritional deprivation and poor health contribute to poor academic performance. According to Lesley et al (2002), poor health and nutrition compromise both the quality of life of school-age children and the potential to benefit fully from what might be the only education these children will receive and also their only chance to escape poverty.

Lesley further identifies the main nutritional problems facing school-age children in sub-Saharan Africa as underweight, stunting, vitamin A deficiency, iron deficiency, and iodine deficiency in contrast with their counterparts in western countries who increasingly suffer from overweight, obesity, hypertension, dental diseases, and anti-oxidant deficiency. Poor nutrition and morbidity are the main causes of poor academic achievement, delayed school enrolment and a high rate of repetition in Kenya (Waweru 1994). A report from UNESCO by Nkinyangi and Van der Vynkt (1995) indicated that 53.3 percent of school children in Kenya are undernourished. There is evidence that children who are hungry or chronically malnourished are less able to learn regardless of the setting (Lesley et al. 2002; Raheela et al 2002). Kapoor and Kant (1999) observe that improving school attendance means improving the health and nutritional status of school children.

The main morbidity problems facing a school-age child in sub-Saharan Africa and in Kenya are malaria, helminthes infection, diarrhoeal diseases, direct and indirect effects of HIV/AIDS and respiratory infections. Most of these diseases are as a result of the poor environmental conditions in which the children live including exposure to

biological, chemical, and health problems (Lesley et al 2002; and Meme 1996). In addition, rapid population growth has led to a diminished land-population ratio and rapid growth of urban centres with the spontaneous growth of slums, unemployment, and under- employment and other undesirable social outcomes such as street children, drug abuse, and prostitution (APHRC 2002).

Urban poverty in Kenya increased from about 29 percent in 1992 to about 50 percent in 1997. Thus, although poverty has always been considered a predominantly rural phenomenon, it is increasingly becoming a critical urban problem as well. Nairobi City registered the biggest increase in overall poverty, which almost doubled from 26 percent to 50 percent between 1992 and 1997. This worsening situation of Kenyans, particularly urban Kenyans, has affected health, education, social welfare, and employment (APHRC 2002).

1.2 Problem Statement

Malnutrition is a major public health problem in Kenya. Among children below five years of age, 53.9 percent are malnourished out of whom 30.6 percent are stunted; 4.8 percent are wasted, and 19.1 percent are underweight (CBS, MOH and ORC. Macro 2004). These high levels of malnutrition are responsible for about 35 percent of child mortality in Kenya annually, yet this problem is preventable (CBS, MOH and ORC. Macro 2004).

In view of the scale of the problem in children under five, nutrition programmes in Kenya since independence have focused on this age group. Thus, most of the available nutritional data are on pre-school children. Traditionally, the main health indicator used by health planners has been mortality rate. School-age children have the lowest mortality among the different age groups and have therefore received low priority in intervention programmes (CBS 1998; Mureithi 1996; Kapoor and Kant 1999; Odoyo 1996). Instead, the use of available resources and international focus has concentrated on reducing infant and child mortality. Health and nutritional deficits constrain the success of

development and prevent poverty alleviation which could be achieved through education (Galal et al 2005). Although there is a growing body of knowledge on the health status of school-age children, little attention has been given to the nutritional wellbeing of this group (Galal et al 2005).

However, malnutrition is a significant problem in older children as well, a fact that is often overlooked by policy makers and program managers (Kapoor and Kant 1999). Studies conducted in the last several years indicate that malnutrition is a problem among school children in Kenya (CBS 2007; Meme 1996; Odoyo 1996 and Choramo 2004). A study done for the Government of Kenya by Nkinyangi and Van der Vynckt in 1995 showed that 53.3 percent of school children were undernourished. Schools, especially those in the urban areas, have little information on under nutrition, infection and ill health among school children (Lesley et al 2002; Odoyo, 1996).

It is believed that school age children do not develop severe malnutrition unless there is famine and also that children of this age have become resistant to many common infections (Lesley et al 2002). However, malnutrition in children under five years does not disappear magically when children cross the 'critical' threshold of five years. Retrospective interpretation where prevalence of stunting in children is high makes it possible to say only that active stunting occurred at some time in the past, perhaps very early in life. In addition, Savage and Burgess (1993) state that school-age children who were under nourished and are still eating poor diets will remain undernourished.

Little is known about the nutrition status of school children in urban squatter settlements (slums) in Kenya. These settlements contain a large proportion of the rapidly growing urban population with high levels of malnutrition already documented in the under-five child population (CBS, MOH and ORC. Macro 2004). Most programs like early childhood development target children aged 0-6 years. Therefore, school children seem to be neglected because there are no programs targeting them, neither is there follow-up after these children attain the age of five years. The extent of burden of ill health and malnutrition among this age group is still not yet fully understood.

The purpose of this study was therefore to fill the gap in knowledge by researching and documenting more on the nutritional status of school children. This study also described the factors influencing the nutritional status of school children of ages 5-14 years in Kieran Location of Nairobi, Kenya.

1.3 Justification

There is need for baseline information in the slums to identify specific determinants of stunting, underweight, thinness, risk of overweight, and overweight among school children. Such information may be useful in designing interventions to modify these determinants and for policy formulation.

There is little information on the nutritional status of school children in Kenya, yet many researchers have documented that school children need to consume a balanced diet so that they can grow properly and have plenty of energy to work, play, and learn (CBS 1998). Results of this study will assist the relevant authorities in planning and implementing nutrition education programmes for improvement of nutrition among school children. This in turn will lead to better health and nutrition status of school children and to increased academic achievement, early school enrolment, lower incidence of repeating, increased child concentration, attentiveness, alertness, and learning.

More data on the health and nutrition of school children are needed to assess the scale of malnutrition, a problem which may until now have been greatly underestimated. Data are also needed to provide guidance in programme development and to provide information for advocacy purposes. This study will provide the information needed to generate appropriate instruments to monitor and evaluate school health and nutrition programmes and to assess their impact on nutrition, health, and education of school children.

1.4 Objectives of the study

1.4.1 Broad objective

To determine factors influencing the nutritional status of school children (5-14 years) in Kieran Location, Nairobi.

1.4.2 Specific Objectives

1. To determine the socio-demographic characteristics of households with school children (5-14 years) in Kieran Location of Nairobi.
2. To determine the environmental (water and sanitation) status of households with school children (5-14 years) in Kieran Location of Nairobi.
3. To determine the morbidity pattern of school children (5 to 14 years) in Kieran Location of Nairobi.
4. To determine the household food security situation of school children (5-14 years) in Kieran Location of Nairobi
5. To determine food consumption patterns of school children (5-14 years) in Kieran Location of Nairobi
6. To determine the nutritional status of school children (5-14 years) in the study area.
7. To determine the relationship between socio-demographic, environmental, food security and food consumption pattern, and child morbidity characteristics and the nutritional status of school children (5-14 years) in Kieran Location of Nairobi.

1.5 Research questions

1. What are the socio-demographic characteristics of households with school children (5-14 years) in Kieran Location of Nairobi?
2. What is the environmental (water and sanitation) status of households with school children (5-14 years) in Kieran Location of Nairobi?
3. What is the morbidity pattern of school children (5-14 years) in Kieran Location of Nairobi?

4. What is the household food security situation of school children (5-14 years) in Kieran Location of Nairobi?
5. What is the food consumption pattern of households with school children (5-14 years) in Kieran Location of Nairobi?
6. What is the nutritional status of school children (5-14 years) in the study area?
7. What is the relationship between the socio-demographic, environmental, food security and food consumption pattern, and child morbidity characteristics and the nutritional status of school children (5-14 years) in Kieran Location of Nairobi?

1.6 Hypotheses

1. There is no relationship between the nutritional status of school children (5-14 years) and socio-demographic characteristics of households in Kieran Location of Nairobi.
2. There is no relationship between the nutritional status of school children (5-14 years) and the environmental (water and sanitation) status of households in Kieran Location of Nairobi.
3. There is no relationship between the nutritional status and morbidity pattern of school children (5-14 years) in Kieran Location of Nairobi.
4. There is no relationship between the nutritional status of school children (5-14 years) and household food security situation and food consumption patterns in Kieran Location of Nairobi.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of available literature on the nutritional status of school children globally and in Kenya. The chapter also provides information on factors affecting the nutritional status of school children as outlined in the objectives.

2.2 Nutrition of School Children

Most of the world's children in the 5-15 years age group attend school with some doing so under difficult circumstances that may cause them to stop schooling before completing high school. In many countries in Africa, Latin America, and South Asia a number of children have lost their parents to HIV/AIDS and other epidemics and also to violence. Consequently, many school children live in material poverty and in sub-standard houses with poor water supply and inadequate sanitation and are often exposed to violence, exploitation, and malnutrition (Worsley *2005).* Over half of the school children are underfed, poorly nourished, and exposed to a range of parasitic and infectious diseases.

Role of Good Nutrition during School-age Period

The benefits of healthy eating patterns in childhood include promotion of optimal health, growth; intellectual development; and prevention of iron deficiency anaemia, obesity, eating disorders, dental carries, and long-term problems such as coronary heart disease. Also, when the nutrition of school girls is improved, they will grow better before and during adolescence (Savage and Burgess 2000). Girls who grow well will be stronger and healthier and when they become mothers they will have larger, healthier babies. This will help to break the cycle of small mothers having low birth weight babies who grow up to become small mothers.

Improved nutrition and health among school children contributes to increased school enrolment, better school attendance and lower rates of dropout, improved performance, and social equity and economic growth (Mwiria 2005). Also, in this age group growth and development continues and therefore there is increased need for energy due to a higher basal metabolic rate (BMR) and activity level and for more proteins to support growth.

Malnutrition among School Children

Stunting is widely believed to occur in early childhood, mainly by the age of three years, through a cumulative process. Children who were exposed to poor nutrition at an early age tend to be stunted throughout their years in school. However, stunting in children can be corrected by providing the right environment (Lesley et al 2002; CBS 2007).

Being underweight for school-age children may reflect a broad range of problems such as prenatal under nutrition, infection, deficiencies of nutrients, and inadequate attention by care givers. Wasting, which reflects acute malnutrition, is not as common as stunting and underweight in school-age children. However, the rate of wasting can change rapidly in situations of acute food crisis as a result of famine, floods, or other calamities (Lesley et al 2002).

A study done in Manila, Philippines, to compare the nutritional status of private and public school children aged 8 to 10 years and to provide baseline information on the nutritional status of urban school children in order to examine the emerging problem of overweight and obesity in this age group showed that, on average, private school children had a much lower prevalence of under-nutrition and a higher prevalence of over-nutrition (Florentino, Villavieja and Lana 2002). Similar results were obtained in another study in West Jakarta and in Bogor, Indonesia, where there were more overweight children in private schools than in public schools (Hardinsyan and Indrus 2002). This study also showed that private school children of all ages and both sexes were heavier and taller than public school children.

In another study, it was noted that malnutrition (stunting and anaemia) in school children was serious and sometimes even worse than in pre-school children and that it increased over the school years affecting boys more than girls (United Nations 2001). In Pakistan, a study to determine the nutritional status of school-age children living in urban squatter settlements showed that overall 44 percent of the children had more than one of the conditions of underweight, wasting, or stunting. Severe malnutrition was detected in 15.4 percent of the children and the prevalence of malnutrition was higher among older children (Raheela et al 2002).

Effects of Malnutrition among School Children

Good health and nutrition are needed for attention, regular school attendance, and optimum class performance. Educational capabilities can be significantly diminished in undernourished children because of impaired ability to concentrate and learn decreased educability, and irregular school attendance due to poor health and nutrition-related illnesses. Mild to moderate malnutrition may alter the processes associated with cognitive function leading to passivity, apathy, shortened attention span, reduced short-term memory, failure to acclimatize to repetitive stimuli, and a lag in the development of sensory-integrative capacity (Maxwell 2005).

Nutrition affects school performance in many ways: malnutrition in the pre-school years leads to a child who is ill-prepared to benefit from schooling; hunger during the school day affects attention and learning capability; and ill health and chronic malnutrition (here anaemia is particularly important) persisting during the crucial early years of education have a pernicious effect on educability (Maxwell 2005).

Malnutrition in pre-school years leads to stunting and other results of malnutrition and these have been widely observed to be associated with reduced school performance. In addition, physical damage to the child because of protein-energy malnutrition (PEM) in the pre-school years may or may not be the main cause of later difficulties. These may also relate to constrained psychological development from reduced play activity, for example. "Severe PEM during the pre-school years affects cognition and

learning", observes Pollitt (1999) who adds: "In a population where malnutrition is endemic children with a history of severe and chronic PEM are handicapped in school".

In other cases, some of the damage of early malnutrition may be irreversible. Cretinism from iodine deficiency involves severe mental retardation. The remedy is to prevent cretinism in the population and iodine deficiency in the mother prior to pregnancy. Nonetheless, children with mild iodine deficiency experience increased activity and mental acuity from iodine supplementation, although some damage could still have been done already. Blindness and visual impairment due to severe vitamin A deficiency may severely handicap educational performance and these too have to be prevented in the pre-school years in addition to ensuring adequate vitamin A nutrition to school children (Maxwell 2005).

2.3 Prevalence of Malnutrition among School Children in Kenya

A study was done in Nyambene District to determine and compare the dietary intake of nutritional status of two groups of children aged five to ten years. One group had a programme for sponsored lunch while the other did not. Results of the study showed that the prevalence of acute malnutrition (wasting) in the group with school lunch feeding programme was 8.6% compared to 2.4% for the group without school lunch feeding programme The prevalence of underweight children in the lunch programme school was 22.2% and that in the non-programme school was 18.4% (Mureithi, 1996).

In Usigu Division, a study of the nutritional status of school children showed that 20% of the children were stunted, 16% were underweight, and 14% were anaemic (Mosomi 1998). Another study done in Kieran, Nairobi on determinants of nutrition in school-age children showed that 24.2% of the children were malnourished, 15.8% were stunted, and only one child was underweight (Mugo 1991).

2.4 Determinants of Nutritional Status of School Children

Socio- demographic Factors of the School Child's Parents

Employment status and income level: Poverty is one of the biggest risk factors contributing to malnutrition in children. The employment status of the parents determines the availability of adequate economic resources at household level including cash to buy food. The level of income will determine the quantity and quality of food purchased. In South Africa, 74% of the non-urban population and 40.5% of the urban population (the majority of whom are black) who are classified as being poor have malnourished children (Labadarios et al 2000 and UNICEF 2006).

Knowledge and schooling: The educational status (level of schooling) of the mother has been found to have a direct relationship with the nutritional status of the child. Unfortunately, little is known about the effects of educational level of alternate care givers, or the father, on nutritional status (Labadarios et al 2000).

Housing: The type of housing that children live in will directly and indirectly influence their health status. Formal planned housing is associated with an adequate water supply and sewage disposal. These factors are known to have a direct bearing on the hygiene and sanitation conditions of the household. Room density (many people in one room) may also play a role with respect to overcrowding and the burden on household resources (Labadarios et al 2000 and UNICEF 2006).

Alternate care givers: In households where the mother is employed, an older sibling or elderly relative (grandmother) will often look after the school child in the mother's absence. Studies have shown that children who are cared for by older children may have a compromised nutritional status. On the other hand, elderly care givers may find the task of looking after small children to be beyond the scope of their physical ability (Labadarios et al 2000 and UNICEF 2006).

Environmental Factors

The state of the physical environment including the state of housing, sanitary conditions, location, and transport facilities can affect children's health and nutrition status and the ability to learn. Lack of ready access to safe water supply and proper sanitation and unhygienic conditions in and around homes have significant implications for the spread of infectious diseases and this can lead to malnutrition. Worldwide, more than 1.1 billion people still lack access to safe water and about 2.9 billion have no access to adequate sanitation leading to infection and also malnutrition (UNICEF 1998 and Labadrois et al 2000).

Childcare Practices

Childcare practices also affect the wellbeing and nutritional status of a child. Care is manifested in the way a child is fed, nurtured, taught, and guided. A child must be fed with the right balanced diet, immunized as expected, and provided with appropriate and timely health care services when sick. In addition, children require emotional support and cognitive stimulation from parents and other care givers. Several studies have found that malnourished children who were given verbal and cognitive stimulation had higher growth rates than those who were not (UNICEF 1998 and (Maunder and Labadrois 2005).

Household Food Security

Household food security depends on access to food. There may be abundant food in the market yet poor families cannot afford to buy it and this can cause malnutrition among school children (UNICEF, 1998). Access to food is in turn dependent on an adequate and stable local food supply. This is influenced by many interacting factors, which play a role in determining the extent of food security. The most frequently cited factors include access to land, livestock ownership, available food garden, safe and accessible water supply, stable climatic conditions, access to food shops, access to alternate food supplies, school feeding, and cash (income) to buy food (Maunder and Labadarious 2002).

Food security of young children also depends on the power relationships within the household. If these relationships are unequal, children may be poorly fed. The power relationships are very dependent on the status of the woman in the house. If only the man makes decisions regarding buying of food then the needs of children may be neglected. This may also happen if households have a large number of people and small children have to fend for themselves during meals.

Peer influence also affects the nutritional status of school children; for example, when children are given money they may use it to buy snack foods of low nutritional quality or spend it entirely on non-food items. According to Kimokoti and Oniang'o (1998), Kenyan parents are hesitant to give money to their children for school lunch for fear that this will be spent on drugs.

Changing lifestyles and dietary patterns also determine nutritional status of a school child. Major societal changes have occurred such that family meal times during which parents and children sit down together to eat and talk are much less common than in previous decades. Children are given money to buy food during the day and even when they eat at home they eat food that is convenient to prepare rather than traditional meals. Therefore, children eat what they want and most of the time such food lacks the required nutrients (Tomkins 1998).

Taste preferences for new food products are slowly changing children's food habits from eating conventional foods in preference for modern "convenience" foods. This change in eating behaviour might be seen in snack pattern, which might change to the main meal. It is advisable to prevent intake of industry-processed ready-to-eat foods that are deficient in macronutrients such as calcium, iron, and vitamins A, B and C (Sharma, 1998). This influences the nutritional status of children and may cause them to become obese or underweight.

Morbidity Pattern of School Children

The poor, especially children in slum areas, carry the greatest burden of

morbidity and mortality. Most of the burden results from hazards within the children's homes or immediate environment. For the poor in low-income countries there is double jeopardy as they are exposed to diseases resulting from poor sanitation and overcrowding and also to chronic heart and lung diseases; this in turn can lead to malnutrition (Lesley et al 2002).

For children in the slum areas of low income countries many of the health problems of childhood are associated with lack of clean water and poor sanitation; for example, diarrhoea, amoebic dysentery, cholera, roundworm, hookworm, whipworm and schistosomiasis. Drinking water is shockingly contaminated with faecal pathogens among poor people in developing countries (Kirimi 2002).

Parasitic infections are a major public health problem throughout the world with over a quarter of the world's population having one or more of these parasites: round worms, whipworms, hookworms, and schistosomes. Prevalence of these infections rises to a maximum in childhood. A school-age child has the most intense worm burden (Lesley et al 2002). A study in Homa Bay showed that 44% of school-age children tested positive for at least one intestinal helminth and the infections were generally of light intensities (Odoyo 1996). Malaria accounts for between 3 percent and 8 percent of all reasons of absenteeism. Evidence suggests that cerebral malaria in early childhood may have an effect on the child's cognitive and learning ability (Lesley et al 2002).

The survival of children and young people is threatened by HIV/AIDS. Every day, nearly 1800 children under 15 years are affected. Children under 15 years account for 13% of new global HIV infections and 17% of HIV deaths annually. Every minute, a child under 15 years dies of an HIV-related illness and every minute another child becomes HIV positive. The pandemic has reversed the gains in child survival made in many of the worst affected countries. Children in sub-Saharan Africa are the hardest hit. HIV/AIDS is denying most of the young children their childhood (UNICEF 2006).

Methodological issues in the anthropometric assessment of school children

Studies on malnutrition need to be approached with caution because of the potential differences in methodology, the cut-off points for weight status classification, and the study population (sample size, maturation, sex). A study done by Clarkin (2005) to find out the methodological issues in the anthropometric assessment of Hmong children in the United States in a sample of (n = 79) Hmong refugee children of age 4-11 years shows that the median Z scores for height, BMI, and the triceps skin fold were -1.04z, + 0.53z, and + 0.18z respectively. Further, 41.7% of the children were above the NHANES 85th percentile for BMI-for-age, categorizing them as overweight/obese.

Assessment of obesity by other established criteria for children such as the triceps skin fold and body fat percentage produced significantly lower estimates than the BMI. This suggests that BMI be employed in conjunction with other methods when assessing overweight/obesity in these groups. Another study done in Greece by Karayiannis et al (2002) to provide national estimates for overweight and obesity in Greek school-age children and adolescents showed that according to the body mass index cut-off points adopted by the International Obesity Task Force (IOTF), 9.1% of girls and 21.7% of boys were classified as overweight, and 1.2% of girls and 2.5% of boys as obese. Corresponding values using CDC growth charts were 8.1% of girls and 18.8% of boys for overweight, and 1.7% of girls and 5.8% of boys for obese showing an increase in obesity rates using CDC values than IOTF.

CHAPTER THREE: METHODOLOGY

3.1 Study Area

The study was conducted in Kibera Location of Langata Division, Nairobi District. Kibera Location was purposively chosen because of its accessibility to the researcher. In addition, a lot of research has been carried out on the nutritional status of children below five years of age in this area but little is known about the nutritional status of school children.

Nairobi City, where Kibera Location is situated, is the capital city of Kenya. It is situated in the southern part of the country south of the equator. The city covers an area of 680 sq km and stands at an average altitude of 1675 m above sea level (CBS 1998). Nairobi is Kenya's principal economic and cultural centre and East Africa's most important commercial, manufacturing, financial, and tourist centre. It is a regional hub for air, road, and rail travel and also one of the largest and fastest growing cities in Africa.

The city has experienced a huge increase in population since Kenya's independence in 1963. According to the 1962 census, Nairobi had a population 266,194 but in 1989 the city's population had risen to 1,324,570. Presently, there are about 3 million people living in Nairobi. Many people from the rural areas have migrated to the city in search of employment, a major factor that has contributed to the fast growth of the urban population. City authorities have been unable to cope with the rapid population growth resulting in the proliferation of slums where basic amenities like water, electricity, roads and refuse disposal facilities are inadequate. About 60% of the current population of Nairobi lives in the slums (APHRC 2003).

Kibera Location is part of the larger Kibera informal settlement also referred to as "Kibera slum". Situated about 5 km from the Nairobi City centre, Kibera slum is one of the largest slums in the country. It is characterized by overcrowding, poor housing structures, and poor environmental sanitation. Kibera Location is divided into four

villages, namely Kibera, Makina, Silanga and Lindi. The Location had 28,701 households according to the 1999 population census.

Majority of the houses in Kibera Location are temporary structures made of iron roofs and mud walls with cement lining on the inside. Some houses have mud lining on the inside walls too. Tenants pay a monthly house rent of Ksh 1000-2500. The area is well served by public transport but due to poor roads access to the interior of the settlement is difficult. The Nairobi-Kisumu railway line passes through the settlement. Communal tap water is supplied by the Nairobi City Council but a few people have private water tanks. The area is well-served by several city council schools. Nairobi District as a whole has 205 public schools with 204,180 students, 184 private schools, and 490 community schools (Thiongo 2008).

The nutritional status of children under five years in Nairobi District is as follows; 18.7% stunted, 4.5% wasted, and 6.3% underweight (CBS, MOH and ORC. Macro 2004) while in Kibera slum 47% of the children in this category are stunted, 2.6% are wasted, and 11.8% are underweight (Olak 2008).

3.2 Study Design

This was a descriptive cross-sectional study to establish the factors influencing the nutritional status of school children in Kibera Location.

3.3 Study Population

The study population comprised all households with school children (5-14 years old) in Kibera Location. The sample consisted of the youngest (5-14 years) school child in 432 households.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

1. All children aged 5-14 years residing in Kibera Location and attending school.
2. Households in Kibera Location with at least one child (5-14 years) attending school.
3. Eligible households who consented to the study.

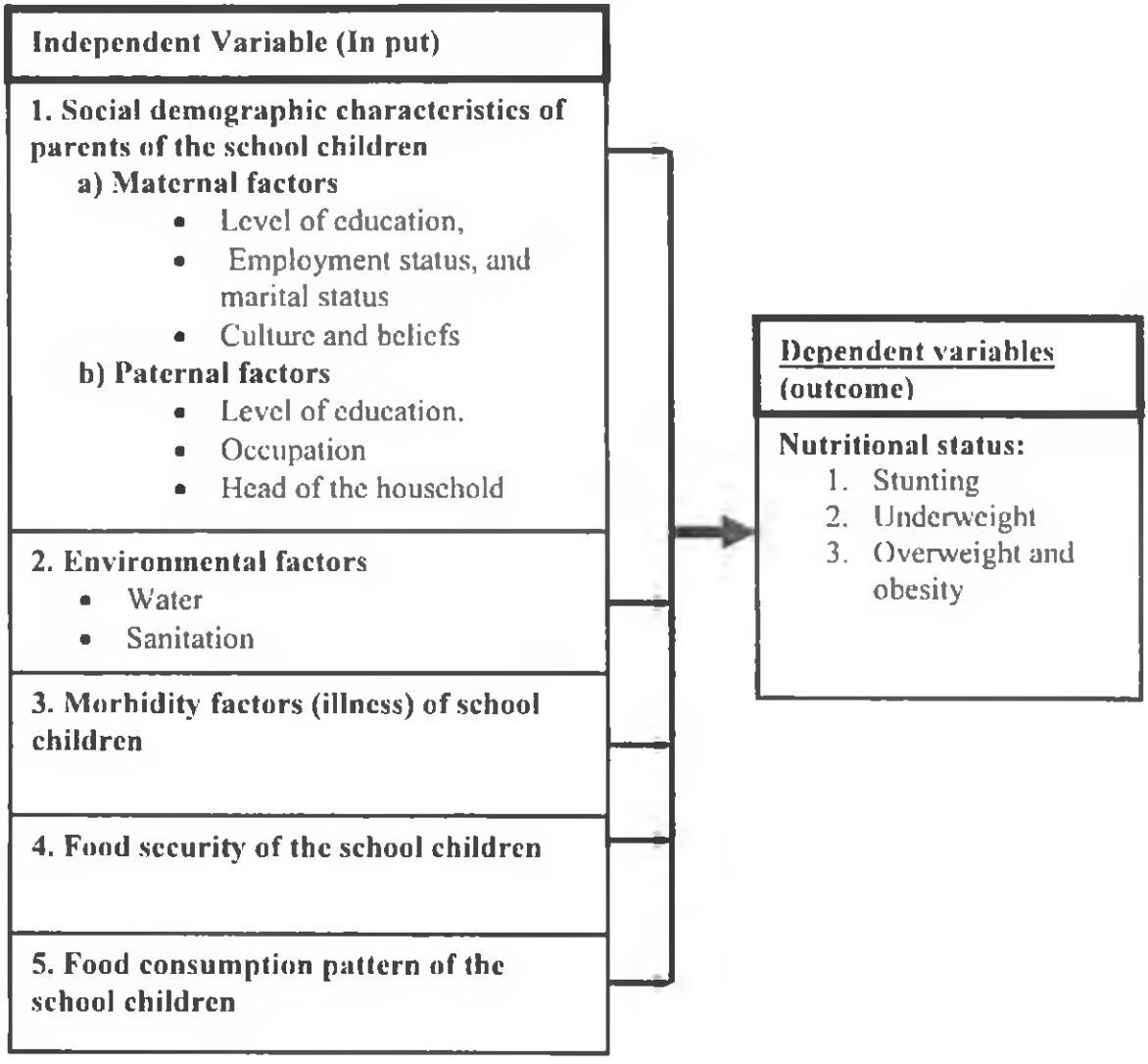
3.4.2 Exclusion criteria

1. Children (5-14 years) not attending school.
2. School children (5-14 years) not resident in Kibera Location at the time of the study.
3. School children (5-14 years) with physical and mental deformities (not related to malnutrition).
4. School children (5-14 years) with chronic diseases (not associated with nutrition).
5. Households that did not have school children aged 5-14 years.
6. Eligible households who did not consent to the study.

3.5 The Study Variables Framework

A model explaining the relationships between the study variables was developed from a modified UNICEF malnutrition model of 1998. According to the study model, the socio-demographic factors, household food security, feeding patterns, water and sanitation, health care seeking behaviour, and cultural beliefs and practices are the independent variables that influence the nutritional status of the child (Figure 3.1).

Figure 3.1: Conceptual framework of factors influencing nutritional status of school children



3.6 Sample Size and Sampling Procedure

3.6.1 Sample Size

The sampling unit for this study was the household. A major advantage of using household level data is that they provide insights into the determinants of nutritional status of the children. These data also provide information about the schooling status and also nutritional status of the school children in relation to each individual's and household's socio-economic status (World Bank 2004).

The prevalence of undernourished school age children in Kenya according to a study by UNESCO in 1995 was 47.7%. This prevalence ratio was applied for determination of the sample size using the formula by Fisher (Kothari 2003).

$$n = \frac{Z^2Pq}{d^2}$$

Where,

n = desired samples size

Z = standard normal deviate, which corresponds to the 95% Confidence level (1.96)

p = proportion in the target population that is estimated to be Undernourished (stunted). The prevalence is 47.7% (UNESCO 1995)

q = (1- p) = 1-0.477 = 0.523.

d = degree of accuracy desired set at 0.05

Hence:

$$n = \frac{1.96^2 \times 0.477 \times 0.523}{(0.05)^2} = 383 \text{ children}$$

Increasing by 10% of 383 for attrition:

n = 383 x 10/100 = 38 children + 383

= 421 children

Only one child was selected from each household hence a total of 421 households with children aged 5-14 years were targeted. The sample size was increased to allow for children who were not at home at the time of the survey and to cater for non-response questionnaires.

3.6.2 Sampling Procedure

Multi-stage sampling method was used to select eligible households. These were households with at least one child within the age range of 5-14 years attending school. The following procedure was used to select households for inclusion in the sample:

Stage 1: Selection of Villages

The study was carried out in all the four villages of Kieran Location, namely Kieran, Makina, Silanga, and Lindi.

Stage 2: Determination of the Number of Households in Selected Villages

The latest official estimates of the population of the study area were obtained from the 1999 national population census reports. These reports indicated that Kieran Location had 28,701 households distributed in the four villages as follows: Makina, 10,589; Silanga 6,281; Lindi, 6,605; and Kieran 5,226. Households forming the study sample were distributed proportionately in the four villages based on the population of each village and the assumption that all households had children aged 5-14 years (Table 3.1).

Table 3.1: Determination of sample size for the four villages in Kieran Location

Village	**Total Number of house holds**	**Number of households to be selected (proportional to size)**
Kieran	5,226	78
Makina	10, 589	155
Silanga	6,281	92
Lindi	6,605	98
Total	**28,701**	**421**

Stage 3: Selection of Households

The following steps were followed when selecting the actual households for the study:

Step 1 Identifying a Starting Point

In each village a central place such as a church, mosque or school was identified to serve as the starting point for the selection of households to study.

Step 2 Identifying a Starting Block/Plot for Selecting Households

At the selected central place within the village, a bottle was rotated by spinning. The direction that the top of the bottle faced upon resting was used to identify the first block/plot of households to be visited. The nearest block/plot in the direction of the bottle top was selected.

Step 3 Selecting Households to Visit

In the identified block/plot of houses, the research assistant visited the nearest household with at least one child in the desired age range. The pre-tested questionnaire was administered to the eligible household and all the required anthropometric measurements taken of the child. This household was then considered as complete. If a household had more than one child in the prescribed age interval then the youngest child was selected. If the selected household had no child in the desired age range the researcher moved on to the next eligible household.

After visiting all the eligible households within a given block or plot, the researcher selected the next block to visit by rotating the bottle at the last household visited in the previous block and then followed the procedure already described. This process was repeated until the desired number of households was visited in each village.

3.7 Data collection

3.7.1 Study tools

1. Questionnaires

The pre-tested questionnaires used in this study comprised several sections each designed to assist in gathering specific data addressing the study objectives. The section on socio-demographic data sought information on factors relevant to the household regarding the environment in which the child lived. The section on Food Procurement and Household Food security data sought information on purchasing patterns and storage of food. There was a section on household food consumption frequency data to help gather information on food diversity and the percentage of children who were not eating enough or well enough. This tool was adopted from *FANTA Guidelines Measuring Household Food consumption: A Technical Guide* available at www.fanta.org. Or from the Food Grains Bank. The tool also helped to measure the quantity and quality of food eaten by people in the study area.

The section on child profile was designed to capture information on the nutrition and health status of the child. Morbidity data were collected by asking the respondents to state if the child had suffered any illness in the two weeks before the interview. If the respondent answered in the affirmative, the interviewer was required to check on the hospital card where one was available. Information on immunization was collected through questioning the respondent and also from the health card where one was available. Information on water and environmental sanitation was collected by asking respondents if they had toilets and where they obtained clean, safe water.

2. Anthropometric Assessment Devices

Trained research assistants used a standardized and internationally described methodology to anthropometrically examine each subject (WHO 1995). The following measurements were taken from each child: weight, height, and age. Each research

assistant had a portable Salter scale, a standard weight for standardizing the scale, and a standiometer for carrying out the measurement.

3.8 Implementation of the Study

3.8.1. Selection and Training of Enumerators

Six students (3 males and 3 females) in their third year of the Bachelor of Science in Nursing course and who had just completed the community diagnosis survey were recruited to collect data as research assistants. Prior to data collection all the research assistants were trained by the investigator and a nutritionist. The following areas were covered during the training:

- Sampling
- Selection of households
- Selection of children within households
- Self-introduction at the household
- Interviewing techniques
- Taking anthropometric measurements
- Filling in the questionnaires
- Ethical issues including confidentiality respect for the respondent
- Obtaining consent

The training had a number of exercises/tasks to ensure that as much as possible the research assistants acquired a comprehensive understanding of the logistical and practical issues involved in the survey and of the expectations in implementing the study.

3.8.2. Pilot study

Twenty (20) questionnaires were filled during the piloting phase of the study at Laini Saba location. The pilot study also incorporated the exercise of using feedback for validation of questionnaires. The principal investigator and research assistants jointly addressed those issues that needed attention before the actual study began.

3.8.3. Implementation of the Study

The study was implemented in December 2007 during the school holidays. The same procedure was followed for every household by the research assistants. Essentially, a researcher visited each randomly selected household as already described. The researcher then interviewed the mother or alternate care giver of the child according to the following procedure:

- The research assistant introduced herself/himself and explained the purpose of the study.
- The interviewee was reassured regarding the confidentiality of the data and requested to answer the questions truthfully.
- An informed consent was obtained from the interviewee (see appendix II on how consent was obtained). Each interviewer completed up to 8 questionnaires per day hence a total of 48-50 questionnaires were completed per day by all the research assistant. Also anthropometric assessments of the child were taken.

Limitations

The period of data collection coincided with the period of active political campaigns of December 2007 and this presented some difficulties for the enumerators. For instance, some eligible households refused to have their children assessed before seeing the enumerators' national identification cards and being told the presidential candidate of choice for the enumerators. The rainy season also delayed the data collection process.

3.9 Data Analysis

Data for all the villages were entered, checked, corrected, and cleaned. EPI INFO 2000 computer program was used to analyze nutritional status. The data were processed using EPI INFO 3.4.3 Nutristat program of EPI INFO 2000 which had the following indicators, anthropometric variable and cut-off points.

Table 3.2: Indicators, anthropometric variables and cut-off points for stunting, underweight and BMI- for-age

Indicators	**Anthropometric Variable**	**Cut-off values**
Stunting or low height-for-age	Height-for-age	< -2 Z-scores
Underweight	Weight-for-age	< -2 Z-scores
Thinness or low BMI-for-age	BMI-for –age	< 5th percentile
At risk of overweight	BMI –for-age	≥ 85th percentile to ≤ 95th percentile
Obese	BMI-for-age	≥ 95th percentile

The above cuts off points are recommended by WHO (2005) for children. SPSS computer program was used to analyze the data and STRATA version 9 (strata corp., Texas) was used to analyze data that were significant by using logistic regression to analyze association between a binary outcome and a number of variables and also to control for confounding factors (age and sex). Descriptive statistics, namely, medians, means and frequency distributions were used to describe the data. The chi square test of significance was used to test the association between the variables and nutritional outcome. The confidence interval represented the range within which the true magnitude of effect lies. Odds Ratio estimated the magnitude of an association between exposure (variable) and malnutrition and the risk of getting malnourished and was used to test the hypotheses.

3.10 Ethical Considerations

1. Consent was sought from the respondent (parent or guardian found in the house) for the research assistants to take measurements and examine the child.
2. Children found to be unwell were referred to the nearest health facility for treatment.
3. Approval for authority to do the study was sought from Kenyatta National Hospital ethics and research committee.
4. Authority was also sought from Ministry of Education, Science and Technology, Nairobi provincial medical officer, District Officer for Kieran and area chief of the respective villages /wards among others.

3.11 Standardization of Instruments to Minimize Errors and Biases

Height and weight are the simplest measurements used for assessing nutritional status of the population. Like all measurements, they are subject to bias and errors in recording if not properly standardized. In this study, the following precautions were taken to ensure good standardization: training research assistants in proper methods of using the standiometer and Salter weighing scale, adjusting the scales regularly before each measuring session, checking for observer error, and rotating field workers among groups of subjects so as to reduce the effect of individual bias. Other precautions involved checking for accuracy before each measuring session by comparing the scale reading with a known weight, and pre-testing questionnaires before the actual study.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents results of the survey on factors influencing the nutritional status of school children (5-14 years) in Kieran Location of Nairobi. The chapter is divided into ten sections as follows: section one is the introduction, section two describes the demographic profile of the respondents in the study, and sections three to ten contain results of the survey as captured for each of the six study objectives.

4.2 Demographic Profile of Respondents

The questionnaire was completed by 432 respondents. Anthropometric measurements were also taken of the youngest child (5-14 years) attending school from households that completed the questionnaire. Respondents included the school child's mother in 86.1% of the households visited, the father in 4.6% households, older siblings in 3.7% in households, and grandparents and aunts/uncles of the child in 2.1% and 3.5% households respectively.

Girls comprised 56% of the children whose measurements were taken while boys constituted 44% of the children studied. Majority (85.8%) of these children were in the 5-9 years age range while 14.2% were in the 10-14 years age range. The modal age of the children studied was 5 years (Figure 4.1.)

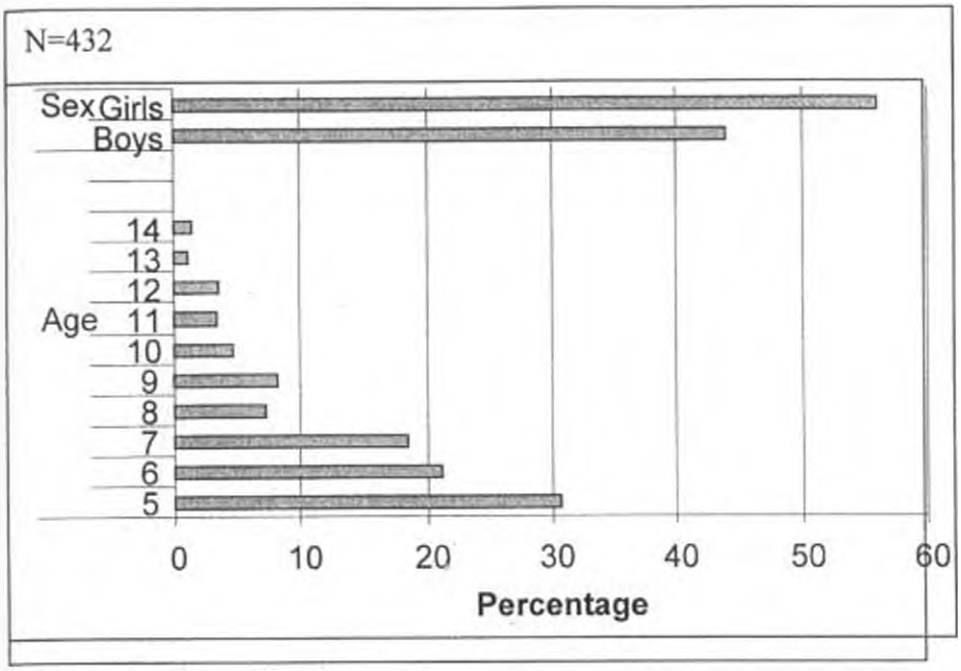


Figure 4.1: Distribution of school children studied by age and sex

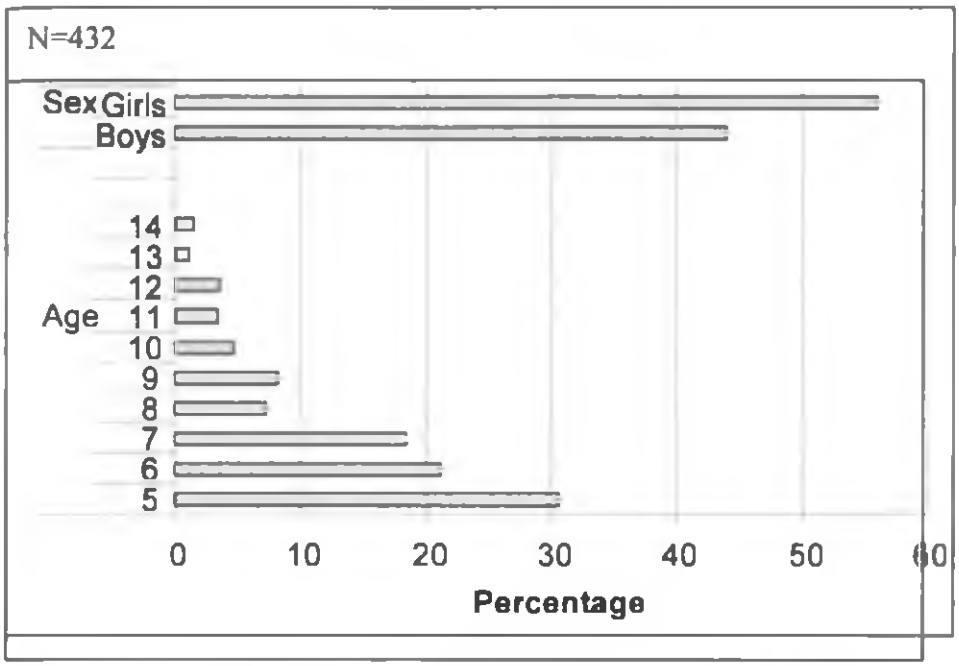
4.3 Socio-Demographic Characteristics of Respondents

4.3.1 Demographic profile of households

There were 2,271 people in the 432 households visited with an average of five people per household and a mode of five people per household as well. In the households visited, 355 children had a father and 407 had a mother. The total number of siblings in all households in the sample was 982 with a mean of two siblings per household. The mode was three siblings per household with a range of 1 to 9. Other members of the household were the grandparents, uncles, and aunts of the school child. The father of the school child studied was the household head in 80.1% of the households, while the school child's mother was the household head in 12.3% of the households. Grand parents headed 4.1% of the households visited while siblings or other relatives headed 3.5 % of the households investigated.

4.3.2 Marital status of the school child's mother

Majority, 86.8%, of the 407 mothers interviewed were married, 5.3% were single, 3.7% were widowed, 2.6% were separated, and 1.4% were divorced.



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4.3.3 Level of education of the mother and alternate care givers

Majority of the mothers (62.2%) had attained primary school education, 27.9% had secondary education, 2.3 % had college education, and 7.5% had no formal education. In the absence of the mother, other members of the household including the house help, older siblings, aunts, uncles or grandparents took up the responsibility of being alternate care givers for the school children. There were 354 households with alternate care givers of whom 49.7% had primary level education, 25.1% had secondary education, 2.5% had college education, and 26.6% had no formal education (Figure 4.2).

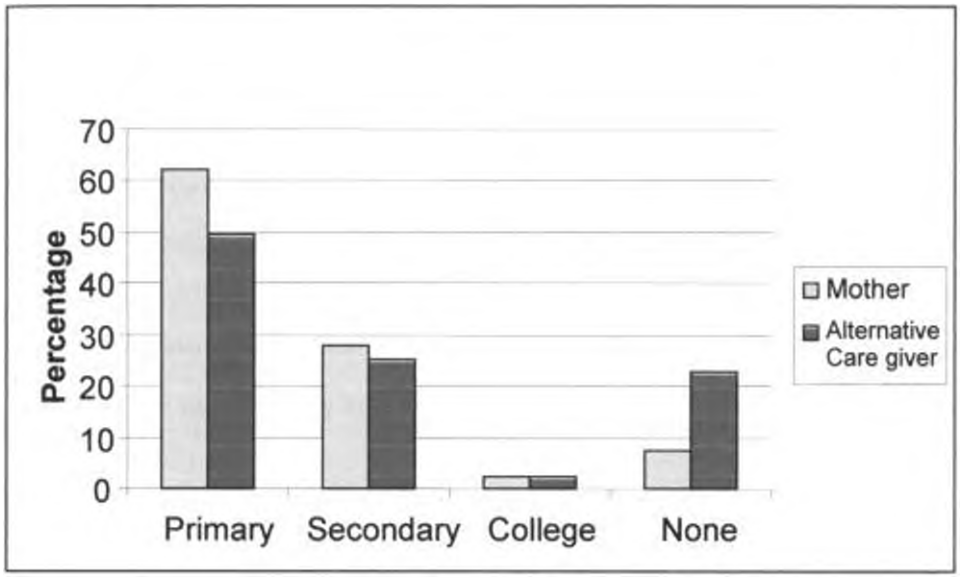

Figure 4.2 Level of education of the mother (N= 407) and alternate care givers (N=354).

4.3.4 Employment status and household income

Almost half of the 407 mothers (45.3%) were unemployed; 29.3% were self-employed; 16.2% were housewives by choice (those who chose not to get formal or self employment) and 9.2% were in formal employment. Forty eight percent of the 355 fathers were wage earners, 20% were in formal employment, 16% were self-employed, and 7% were unemployed (Figure 4.3, N=355).

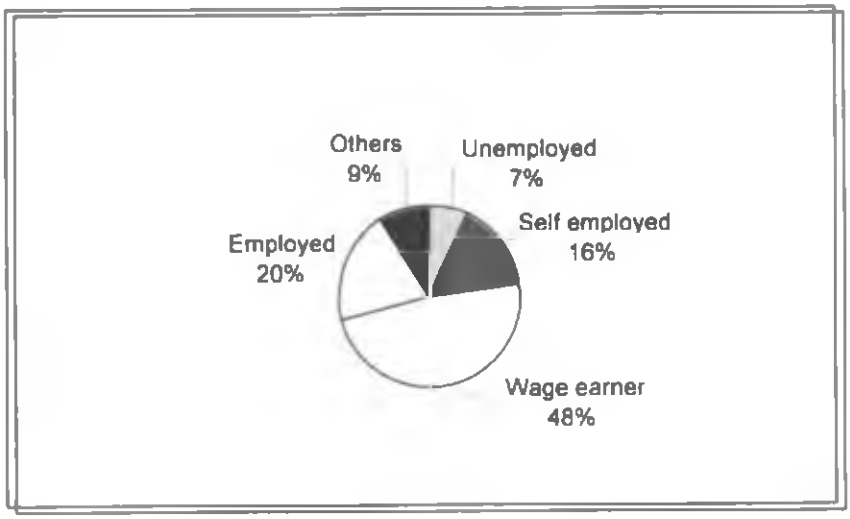

Figure 4.3: Employment status of the school children's (5-14 years) fathers

Only one person provided the entire household income in 61.4% of the 432 households studied, whereas more people contributed to the household income in 38.6% of the households. About 40% of the households had a monthly income of between Ksh1, 000 and Ksh7, 000 while 27% said they earned a monthly income of more than Ksh7, 000. The monthly income was less than Ksh1, 000 in 4% of the households visited (Table 4.1).

Only 278 respondents answered the question on their sources of income. Out of this number, 83.8% stated that they had only one source of income whereas 16.2% indicated that they had several sources of income (including relatives, loans, and business profits). Most of these respondents, 71.3%, also indicated that the income stated had been consistent over the last six months before the study.

Table 4.1: Distribution of respondents by monthly income.

Monthly Income (Ksh)	Frequency N=278	Percentage
Less than 1000	10	4.0
1000-4000	100	40.4
4001-7000	71	28.6
7001-10,000	34	13.7
More than 10,000	33	13.3
Total	**278**	**100**

4.3.5 Housing conditions

More households stated that they lived in rented houses than those who indicated that they owned the houses they were living in. The houses varied in size from those with only one room to some with more than two rooms. The type of floor, walls, and roofs of the houses also varied from house to house (Table 4.2).

Table 4.2: Distribution of respondents by ownership and type of housing structure

Variable		Frequency	Percentage
Ownership	Rented	395	91.4
	Owner	37	8.6
	Total	**432**	**100**
No. of rooms	One	333	77.3
	Two	72	16.5
	>two	27	6.2
	Total	**432**	**100**
Roof type	Corrugated	425	98.4
	Flattened tin	7	1.6
	Total	**432**	**100**
Wall type	Mud	390	90.2
	Brick	26	6.2
	Corrugated iron	12	2.7
	Timber	4	0.9
	Total	**432**	**100**
Floor type	Cemented	300	69.4
	Earth	132	30.6
	Total	**432**	**100**

4.3.6 Type of fuel used

The households used paraffin and charcoal as sources of cooking fuel. The two fuel types were used either alone or in combination. Households also used other types of fuel like firewood and cooking gas (Figure 4.4).

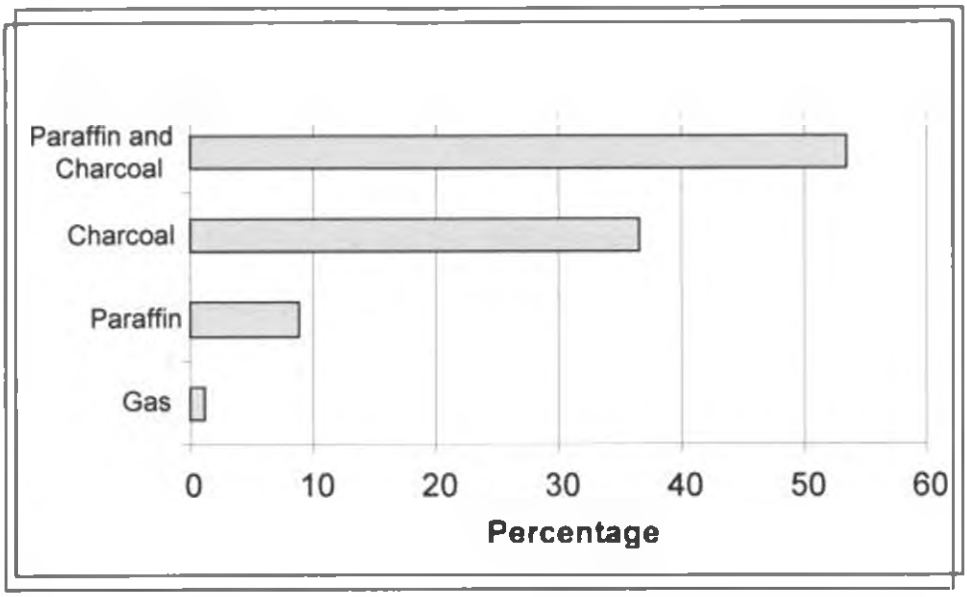

Figure 4.4: Distribution of respondents by type of fuel used for cooking

4.4 Environmental (Water and Sanitation) Status of Households

4.4.1 Sources of water

Majority of the respondents (97.9%) indicated that they bought water, 0.7% had access to free water from communal taps, and 1.4% said they obtained water from private (household) taps. Some households (9.5%) reported a daily water consumption of 10-50 litres, 68.6% used 51-100 litres, 11.0% used 101-150 litres, 9.5% used 151-200 litres, and 1.7 % used more than 200 litres of water per day. The mean cost of water for the households was Ksh 2.50 for every 20 litres of water with a range of between Ksh 2.00-3.00 (CI 0.7-1.5).

4.4.2 Access and ownership of toilet facilities

Majority of the respondents (90.3%) stated that they had access to toilet facilities. Access to pit latrines was by 96.7% of the households, 1.2% had flush toilets and 1.4% used "flying toilets". Some households, 0.7%, reported alternatives such as relieving themselves along the railway line or using the neighbour's toilet (Figure 4.5). Most of the toilets, 94.4%, were communal while 5.6% were privately owned.

Although most of the respondents indicated that their house rent was inclusive of payment for toilet facilities, 95 respondents stated that they made separate payments for toilet facilities and rent. The extra cost for toilet facilities varied according to the number of people in the household but 60% of those who paid directly for these facilities stated that they spent between one and ten shillings per day while 40% said they spent between 11 and 50 shillings per day (the cost was dependent on the number of people in the household and the frequency of use of the facilities).

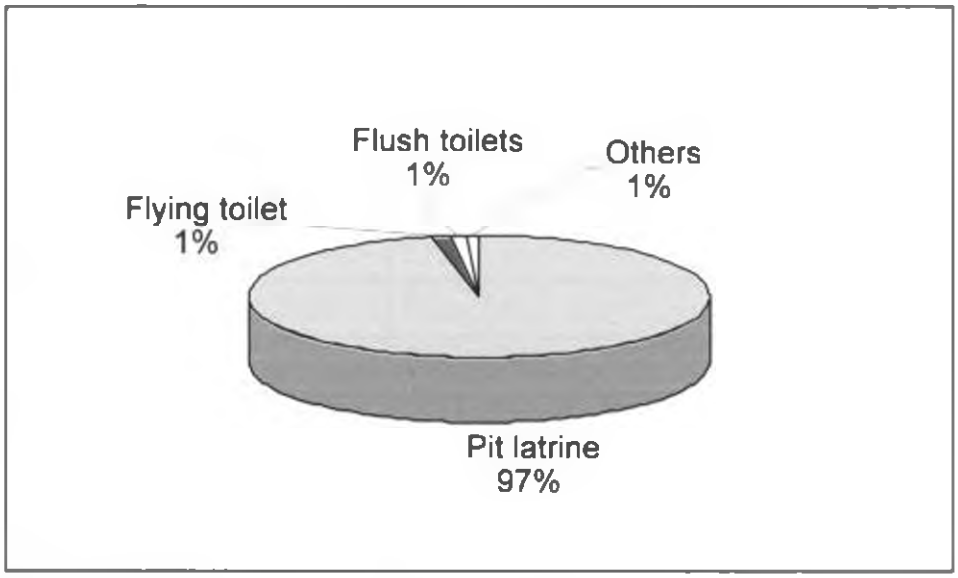

Figure 4.5: Type of toilet used by respondents

4.5 Morbidity Pattern and Health Seeking Behaviour for the School Child

4.5.1 Child morbidity

The school child under investigation had not suffered any illness in the two weeks before the interview in 54% of the cases while 46.4% of the children had been ill during this period. The various illnesses reported by the respondents were upper respiratory tract infections (URTI), malaria, diarrhoea, ring worms, skin infections, and measles among others which could not be classified (Table 4.3). Almost all the households (99.8%) indicated that the school children under their care did not suffer any disability while 0.2% reported the presence of rickets and dumbness.

Table 4.3: Commonly reported illnesses among school children studied

Illness	Frequency (n)	Percentage (%)
Malaria	26	12.7
Diarrhoea	10	4.9
Measles	1	0.5
URTI	85	41.7
Dental carries	4	2.0
Skin conditions	12	5.9
Eye infections	10	4.9
Common cold	10	4.9
GIT problems	6	2.9
Ring worms	8	3.9
Asthma	2	1.0
Others	30	14.7
Total	**204**	**100.0**

Thirty five percent of the respondents took their children to public hospitals for health care services. The remaining respondents indicated that they sought health care services from a combination of other sources (Table 4.4). Most of the respondents stated that health facilities were affordable (79.2%) and accessible (89.5%).

Table 4.4: Health Facilities Most Commonly Used by School Children Studied

Health facility	Frequency (n)	Percentage
Hospital	150	34.9
Private clinic	132	30.5
City council clinic	46	10.7
Both Hospital & private clinic	43	10.0
Both Private & City council clinic	12	2.6
Both Hospital & City council clinic	6	1.4
NGO facilities	28	6.5
Other sources	15	3.5
Total	**432**	**100.0**

Note: Other sources were over the counter medications, herbal clinics, prayers and traditional/ home made remedies.

4.6 Food Security Situation of Households

4.6.1 Household weekly expenditure on food

The household weekly expenditure on food varied among the households. Whereas 44.9% of the households spent between Ksh 1001 and Ksh 2000, less than one percent of the households spent more than Ksh 10 000 on food per week (Table 4.5).

Table 4.5: Household weekly expenditure on food.

Amount spent on food (Ksh)	Frequency	Percentage
<1000	132	30.5
1001 – 2000	194	44.9
2001 – 4000	60	14.0
4001 – 10 000	8	1.9
Over 10000	1	0.2
Do not know	37	8.6
Total	**432**	**100.0**

4.6.2 Main decision maker on food purchases and serving

In all the villages and for children of all age groups, the mothers were responsible for food purchases, food preparation, and actual feeding of the children (Table 4.6).

Table 4.6: Decision-making on expenditure on food, food types and feeding the children

Person who makes decision	Food bought	Serving child	Amount spent
	No. (%)	**No. (%)**	**No. (%)**
Father	14 (3.3)	3 (0.7)	125 (29)
Mother	379 (87.7)	379 (87.9)	272 (63.1)
Sibling	14 (3.3)	19 (4.4)	4 (0.9)
Grandparent	11 (2.5)	11 (2.6)	15 (3.5)
Others	14 (3.2)	20 (4.4)	16 (3.5)
Total	**432 (100)**	**432 (100)**	**432 (100)**

4.6.3 Availability to food

Almost all households (99%) obtained their entire supply of foodstuff from retail shops. Wholesale or own produce were not popular sources of food for the households (Table 4.7).

Table 4.7: Sources of household food

Sources of Food	Animal food No. (%)	Fruits No. (%)	Nuts/ legumes No. (%)	Vegetables No. (%)	Roots/ tubers No. (%)	Cereals No. (%)	Fats/Oils No. (%)
Purchase (kiosk/retail)	422 (97)	412 (98.6)	417 (96.9)	424 (98.4)	422 (98.6)	425 (98.6)	427 (99.1)
Purchase whole sale	5 (0.5)	4 (1.0)	12 (2.3)	4 (0.7)	10 (1.4)	6 (1.2)	5 (0.9)
Given/donation	4 (0.7)	0 (0)	3 (0.5)	1 (0.2)	0 (0)	1 (0.2)	0 (0)
Own produce	1 (0.2)	2 (0.5)	1 (0.2)	3 (0.7)	0 (0)	0 (0)	0 (0)
Total	**432 (100)**	**432 (100)**	**432 (100)**	**432 (100)**	**432 (100)**	**432 (100)**	**432 (100)**

About 59.4% of the respondents stated that their school children never went without food. 19.7% stated that children went without food at least once a week, 12.8% reported that children missed food two times in a week, and 5.3% reported that the children missed food three times per week. Only 2.8% of the respondents stated that children went without food "occasionally". (Figure 4.6)

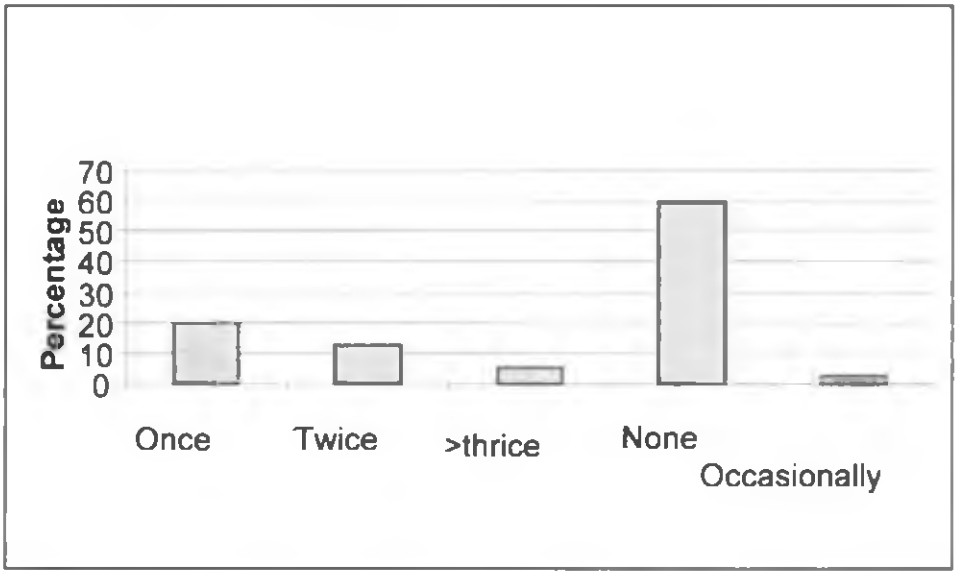

Figure 4.6: The average number of times that the school child misses food per week

4.6.4 Obtaining food on credit

About 67.8% of the respondents reported that they sometimes obtained food on credit while 32.8% did not obtain food on credit. The frequency of credit purchases of foodstuff varied from once a week to several times per week (Table 4.8.

Table 4.8: Access to food on credit facility

Times (week/day)	Frequency	Percent (%)
Once	74	25.1
Twice	76	25.8
A few days to end month	70	23.7
3-5 times	49	16.6
> 5 days	26	8.8
Total	**295**	**100.0**

4.6.5 Food taboos relating to children

Majority of the respondents (76.4%) did not know of any cultural beliefs or food taboos relating to children. However, 23.6% were aware of taboos relating to children. Most of the food taboos reported by the respondents prohibited children from eating animal products like pork, chicken, eggs and mutton among others (Table 4.9). About half (50.5%) of the respondents who were aware of food taboos indicated that they did not practice them.

Table 4.9: Practiced food taboos relating to children

Food taboo	Frequency	Percentage (%)
Children should not eat pork	19	19.8
Children should not eat chicken and sweet potatoes	8	8.3
Children should not eat eggs	16	16.7
Pregnant women should not eat eggs	7	7.3
Children should not eat gizzards	29	30.2
Children should not eat mutton	4	4.2
Others	13	13.5
Total	**96**	**100.0**

4.6.6 Availability of school lunch

Most of the children (79%) studied were provided with lunch at school while 20.7% indicated that their schools did not provide lunch. The school lunch menu consisted of rice, beans, vegetables, maize meal and kales (*sukuma wiki*), and a mixture of maize and beans (Table 4.10).

Table 4.10: Composition of school lunch

Variable	Frequency N=335)	Percent
Rice, beans and vegetables	286	85.4
Maize and beans (Githeri)	39	11.6
Ugali and sukuma wiki	10	3.0
Total	**335**	**100.0**

The 97 children whose schools did not provide lunch had various arrangements for obtaining lunch including going back home for lunch, buying food, or being brought food from home by their mothers (Table 4.11).

Table 4.11: Sources of food for children not on school lunch programme

Source of food	Frequency	Percentage
Go home for lunch	66	68.1
Carry food always	15	15.5
Mother brings food to child	8	8.2
Carry food occasionally	4	4.1
Carry money for lunch always	3	3.1
Stay without food	1	1.0
Total	**97**	**100.0**

4.7 Food Consumption Patterns of School Children

4.7.1 Number of meals

Most of the sampled school children (95%) took an average of three meals per day with a few of them taking snacks between meals as well (Table 4.12).

Table 4.12: Daily meal frequency for the school children

Food eaten last 24 hrs	Frequency N=432	Percent (%)
Before breakfast	7	1.6
Breakfast	408	94.9
Mid morning snack	124	28.8
Lunch	392	91.6
Afternoon snack	156	26.3
Supper	423	98.4
After supper	21	3.1

Note: this was a multiple response question

4.7.2 Quality of diet consumed by the school children

The food consumption pattern of the school children indicated that cereals,

fats/oils, vegetables and milk products were consumed daily. Children from the majority of households consumed animal products (meat) once a week (26.3%) to three times a week (36.6%). Most of the children ate fruits daily or at least twice a week. Nuts and legumes were consumed between once and three times per week. A similar trend was observed for roots and tubers (Figure 4.7, N=432).

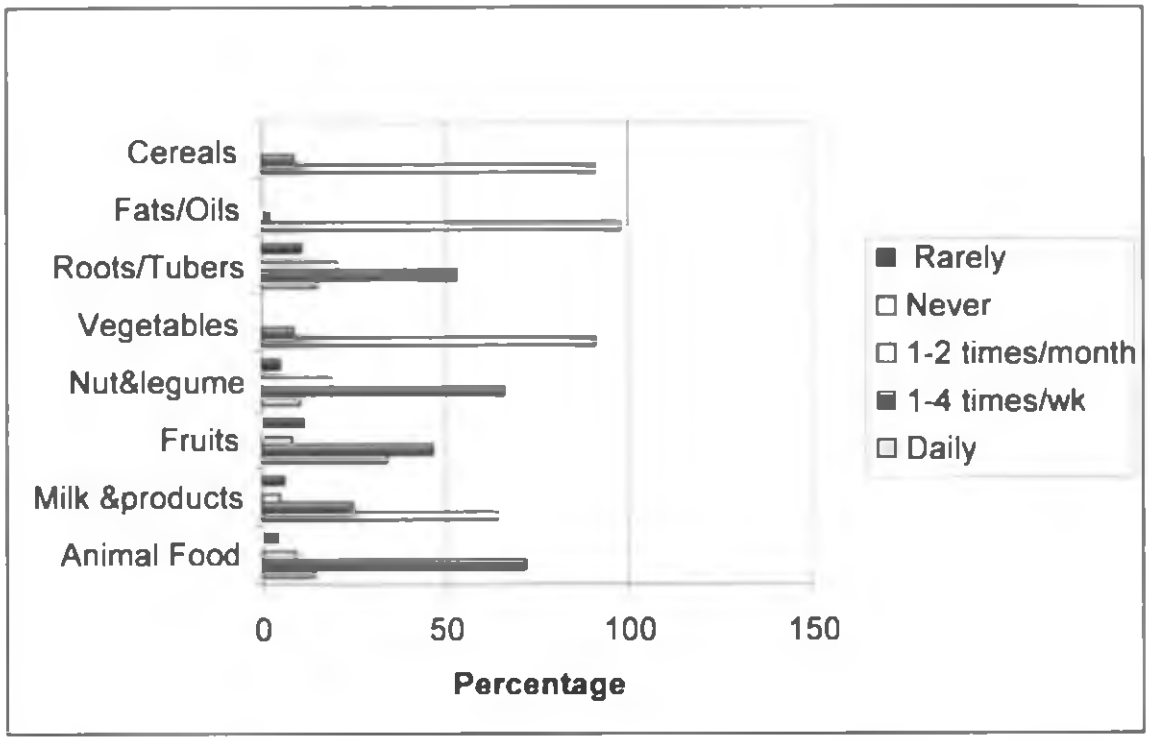

Figure 4.7: Diet composition and frequency of consumption of different food types for sampled school children

4.7.3 Food consumption pattern in the last 24 hours before the study

An average of five major food groups were represented in the diet of more than half of the school children studied during the last 24 hours before the interview. The modal food group was that of fats and oils (Figure 4.8).

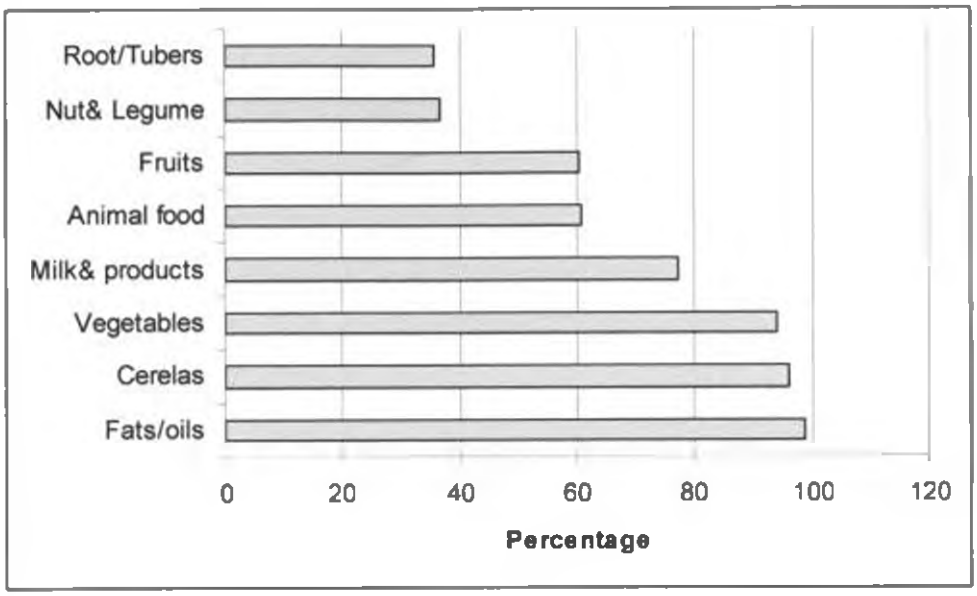

Figure 4.8: Consumption of food from the eight food groups in the last 24 hours before the study

4.8 Nutritional Status of the School Children

The nutritional status of the school children was assessed using the anthropometric indicators of body mass index (BMI for age), weight-for-age (wt/age), and height-for-age (ht/age). The prevalence of stunting (height for age <-2 Z scores) was 35%, the prevalence of underweight (weight for age < -2 Z scores) was 26.0%, prevalence of thinness (BMI-for-age < 5th percentile) was14.8 %, prevalence of overweight (BMI >85th percentile) was 7.1%, and prevalence of obesity (BMI >95th percentile) was 6.3% among the children studied (Table 4.13). There was a higher level of malnutrition among girls than boys. Younger children in the 5-7 years age group had higher prevalence of malnutrition (Table 4.14) although this difference was not statistically significant (Appendices IV and V).

Table 4.13 Nutritional status of the school children studied

Indicators	Cut off parameters	Nutritional status	freq.	%
Height –for-age	< -2 Z scores	stunting	145	35%
weight-for-age	< -2 Z sores	underweight	110	26%
BMI-for-age (weight for height)	<5th percentile	thinness	54	14.8%
	≥85th percentile <95th percentile	Overweight	25	7.1%
	≥95th percentile	obesity	23	6.3%

Table: 4. 14 Nutritional status of school children by age and sex

		Nutritional status							
		Height-for-age (stunted)		Weight-for-age (underweight)		BMI for age(W/H) (Thinness and overweight)			
		N	%	N	%	N	%	n	%
Sex	M	69	48	51	46	20	37	25	52
	F	74	52	60	54	34	63	23	48
Age	5-7	72	51	70	64	33	61	34	71
	8-10	50	35	31	28	19	12	25	
	11-14	20	14	9	8	2	4	2	4

4.9 Results of bivariate Analysis

Factors Affecting the Nutritional Status of School Children in Kieran Location

The various independent variables of the study were analysed against the nutritional status (stunting, underweight, overweight and obesity) of the school children as the outcome variable. A chi-square test was done at a significance level of < 0.05 and an odds ratio (OR) with its 95% confidence interval (CI) determined.

4.9.1 Socio-Demographic Factors and the Nutritional Status of School Children

Gender of household head

Stunting

Thirty six percent of the stunted children were from households headed by the father. However, there was no significant relationship ($p=0.29$) between the father being the household head and the prevalence of stunting among the school children (Table 4.15).

Table 4.15: Relationship between the father as household head and stunting in sampled school children

	Normal	Stunted	Total	χ2	P value	OR (95% CI)
Father	215, (64%)	120, (36%)	335, (100%)	1.089	0.297	0.75 (0.4-1.2)
Mother	59, (70%)	25, (30%)	84, (100%)			
Total	274 (65%)	145, (35%)	419 (100%)			

Underweight

There was no relationship between the household head and the incidence of underweight among the school children.

Overweight and obese

There was a significant relationship between the head of the household and levels of overweight and obesity among the school children. The prevalence of overweight and obese children from households headed by the father was 14% compared to 5% for households headed by the mother. Children from households headed by the father were 0.29 times more likely to be obese than those from households headed by the mother. (Table 4.16).

Table 4.16: Relationship between household head and occurrence of overweight and obesity in school children

	Normal	Overweight and obese	Total	χ2	P value	OR 95% CI
Father	208, (86%)	35, (14%)	243, 100%)	3.68	0.049	0.29 (0.1-0.9)
Mother	62, (95%)	3, 5%)	65, (100%)			
Total	270, (88%)	38, (12%)	308, (100%)			

Marital and education status of the mother

Stunting

Children whose mothers had some formal education were 0.39 times less likely to be stunted than those whose mothers had no formal education (Table 4.17). These findings were statistically significant (p= 0.041). The proportion of stunted children was 35% among married mothers compared to 32% for single mothers. However, this relationship was not statistically significant (p=0.59).

Table 4.17 Relationship between maternal education status and stunting in school children

	Normal	Stunted	Total	$\chi 2$	P value	OR 95% CI
Mother educated	250 (65%)	134 (35%)	384 (100%)	4.17	0.041	0.39 (0.2-0.9)
Mother never went to school	28 (82%)	6 (18%)	34 (100%)			
Total	278 (67%)	140 (33%)	418 (100%)			

Underweight

The incidence of underweight school children was 28% in households with married mothers compared to 25% among households with unmarried mothers. In addition, the proportion of underweight school children of educated mothers was lower (27%) compared to that recorded (36%) for children of less educated mothers. However, this difference was not statistically significant.

Overweight and obesity

Married, educated mothers had a higher proportion of obese children than their single, less educated counterparts. Households with married mothers had 13% of their children as overweight compared with 8% of overweight children from households with single mothers. It was also observed that 28% of the overweight children were from households with educated mothers compared to 36% from those with non-educated mothers. However, these differences were not statistically significant.

Education status of the alternative care giver

Stunting, underweight, and overweight and obesity

School children who were under the care of an alternate care giver with no formal education were 13.2 times more likely to be stunted and 0.31 times less likely to be overweight and obese compared to children who were taken care of by an alternate care giver with formal education (Table 4.18). These findings were statistically significant for stunted children (p= 0.0001) and for overweight and obese children (p = 0.04) (Table 4.19). However, the relationships were not statistically significant for the variable underweight among the school children.

Table 4.18: Relationship between educational status of the alternate care giver and stunting in school children

	Normal	Stunted	Total	χ2	P value	OR 95% CI
Attended school	177, (86%)	28, (14%)	205 (100%)	1.5.4	0.0001	13 2 (7 7-22)
Never attended school	45, (32%)	94, (68%)	139, (100%)			
Total	222, (65%)	122, (35%)	344, (100%)			

Table 4.19: Relationship between educational status of the alternate care giver and level of overweight and obesity in school children

Education status of alternative care giver	Normal	Overweight and obese	Total	χ2	P value	OR 95% CI
Attended school	168, (84%)	33, (26%)	201, (100%)	3.99	0.045	**0.31 (0.1-0.99)**
Never attended school	50, (94%)	3, (6%)	53, (100%)			
Total	218, (86%)	36, (14%)	254, (100%)			

Employment status of parents

There was no significant relationship between the employment status of the mother (p=0.45) or the father (p=0.51) and prevalence of stunting in school children although there was a higher percentage (40%) of stunted children among unemployed fathers. The employment status of parents did not have any significant effect on the nutritional status of the school children in terms of underweight (p= 0.09) and overweight and obesity (p=0.38).

Household average monthly income

There was no significant relationship between the total household income and the prevalence of stunting (p=0.71) and underweight (p = 0.23) among the school children. However, there was a significant relationship between household average monthly income and overweight and obesity (p= 0.01). The study revealed that households whose average monthly income was more than Ksh 4000 had four times more overweight and obese children than those whose monthly income was below Ksh 4000 (Table 4.20).

Table 4.20: Relationship between household average monthly income and nutritional status of the school children (overweight and obese in children)

Household income (Ksh.)	Normal	Overweight & obese	Total	$\chi 2$	P value	OR 95% CI
Ksh up to 4000	64. (89%)	8. (11%)	72. (100%)	5.43	0.019	2.64 (1.1-6.1)
> 4000	97. (75%)	32. (25%)	129. (100)			
Total	161. (80%)	40. (20%)	201. (100%)			

Household size

There was a statistically significant relationship between household size and the nutritional status of school children (p =03). Children from households with less than five members were 0.62 times less likely to become underweight (Table 4.21). However, the relationships between household size and stunting and household size and overweight and obesity among the school children were not statistically significant

Table 4.21: Relationship between household size and nutritional status of the school children (underweight)

Household size	Normal	Underweight	Total	$\chi 2$	P value	OR (95% CI)
<5 members	180, (70%)	77, (30%)	257, (100%)	4 25	0.039	0 62 (0 23-0 9)
> 5 members	129, (79%) (	34, (19%)	163, (100%)			
Total	309, (85%)	111, (15%)	420, (100%)			

4.9.2 Household food security and nutritional status of school children

Weekly expenditure on food

There was no significant relationship between the household weekly expenditure on food and the nutritional status of school children. However, there were more stunted children (73%) from households with a weekly expenditure on food of less than Ksh 2000 compared to households that spent more than Ksh 2000 on food weekly where the level of stunting among school children was 27%. An inverse relationship was also observed between the prevalence of underweight children and the household weekly expenditure on food (out of 94 underweight children 76 (81%) were from households that spent less than Ksh 2000 on food weekly).

Households whose weekly expenditure on food was less than Ksh 2000 had a lower

incidence of overweight and obese children (22% or 8 out of 37 overweight and obese children) compared to households whose weekly expenditure on food was more than Ksh 2000 (with 78% or 29 out of 37of the overweight and obese children).

Mother as the main decision maker on amount to be spent on food

There was a significant relationship between the nutritional status (stunting) of school children and the mother as the main decision maker on the amount of money to be spent on food (p=0.02). It was observed that households where the mother was not the main decision maker were 2.51 times more likely to have stunted children than households where the mother was the main decision maker on the amount of money to be spent on food (Table 4.22).

Out of 38 obese children, 37 were from households where the mother was the main decision maker on the amount of money to be spent on food. However, this relationship was not statistically significant. Also, the relationship between the mother as the main decision maker and the incidence of underweight among the school children was not statistically significant.

Table 4.22: Relationship between the main decision maker on total expenditure on food and the nutritional status of the school child (stunting)

Decision maker on amount of food spent on food.	Normal	Stunted	Total	$\chi 2$	P value	OR (95% CI)
Mother	136 (37%)	230 (63%)	366, (100%)	5.41	0.02	2.51 (1.1-5.6)
Other	8 (20%)	34 ((80%)	42. (100%)			
Total	144 (35%)	264. (65%)	408. (100%)			

Mother as the main decision maker on the type of food to be bought

There was a significant relationship (p=0.02) between the mother being the main decision maker on the type of food to be bought in the household and the nutritional status

of the child. It was noted that school children from households where the mother was the main decision maker on the type of food to be bought were 0.42 times less likely to become underweight than those from households where this role was performed by other members of the household (Table 4.23). However, there was no relationship between the mother as the main decision maker on the type of food to be bought for the household and the incidence of underweight, overweight and obesity among school children.

Table 4.23: Relationship between the main determinant of the type of food to buy and the nutritional status of the school children

Main determinant of food to be bought	Normal	Underweight	Total	χ2	P value	OR (95% CI)
Mother	230, (71%)	95, (29%)	325, (100%)	5.. 32	0.021	0.422 (0.2-0.9)
Others	40, (87%)	6, (13%)	46, (100%)			
Total	270, (63%)	101, (27%)	371, (100%)			

Mother as main person serving food to the child

There was a significant relationship between the mother as the main person who served food for the school children and the nutritional status (underweight, overweight and obese) of the children. Children who were served by their mothers were 0.40 times less likely to become underweight and 0.39 less likely to become overweight or obese (Table 4.24). However, there was no significant relationship between the mother as the main person serving food to the child and the incidence of stunting among school children.

Table 4.24: Relationship between the main person serving food to the child and nutritional status (underweight) of the school children

Person who serves food to the child	Normal	underweight	Total	$\chi 2$	P value	OR (95% CI)
Mother	264, (72%)	104, (28%)	368, (100%)	4.86	0.027	0.40 (0.2-0.9)
Others	44, (86%)	7, (14%)	51, (100%)			
Total	308, (74%)	111, (26%)	419, (100%)			

Table 4.25: Relationship between the main person serving food to the child and nutritional status (overweight and obese) of the school children

Person who serves food to the child	Normal	Overweight and obese	Total	$\chi 2$	P value	OR 95% CI
Mother	277, (74%)	96, (26%)	373, (100%)	4.398	0.036	0.39 (0.2-0.9)
Others	36, (86%)	6, (14%)	42, (100%)			
Total	271, (73%)	100, (27%)	371, (100%)			

Relationship between number of meals per day and the nutritional status of school children

There was a significant relationship (p=0.003) between the frequency of meals taken per day and the nutritional status of the child (stunting). Children who took less than three meals per day were 2.42 times more likely to become stunted and 2.42 times more likely to become underweight (P value 0.036, OR 2.42 and CI 1.2-5.1)

There was no significant relationship between number of meals taken per day and the incidence of overweight and obesity (p = 0.65) among the school children.

Relationship between missing food and the nutritional status of school children (stunting)

There was a significant association (p=0.01) between the number of times the child missed food in a week and the child's nutritional status. Sixty eight percent of the stunted children indicated that they missed food a couple of days per week compared to 32% of the stunted children who reported that they did not miss food at any time. Other variables of food security like food taboos practiced, food taken on credit or "begged" did not seem to have any significant effect on the nutritional status (stunting) of school children.

There was a slightly higher percentage (55%) of underweight children who went without food sometimes compared to those who always had food (45%). This difference was not statistically significant. Also, missing food appeared to have no effect on the incidence of overweight and obesity among school children.

Relationship between obtaining food on credit and nutritional status of school children

There was no significant relationship between obtaining food on credit and the nutritional status of the child (stunting, underweight, and overweight and obesity).

4.9.3 Environmental Factors and Nutritional Status of School Children

Relationship between water source and nutritional status of school children

There was a significant relationship between the households' source of water and the nutritional status (underweight p= 0.026) of school children. Children from households with private tap water had an 86% less chance of becoming underweight than children from households that used communal tap water. There was no significant relationship between the household's source of water and the incidence of stunting and overweight among the school children.

Table 4.26: Relationship between water source and nutritional status of school children (underweight)

Source of water	Nutritional status (underweight)					
	Normal	Underweight	Total	$\chi 2$	P value	OR 95% CI
Private tap	2, (29%)	5, (71%)	7, (100%)	4.9	0.026	0.14 0.0-0.7
Communal tap	303, (74%)	109, (26%)	412, (100%)			
Total	305 (73%)	114, (27%)	419, (100%)			

Relationship between amount of water used per day and nutritional status of school children

There was no significant relationship between amount of water used per day and the nutritional status of school children.

Type of house

There was a significant relationship (p=0.03) between the type of house floor and the nutritional status of the school child. Children living in houses with cemented floors were 0.62 times less likely to become stunted than those whose houses had earth floors. In addition, more stunted children (93%) came from households living in temporary rental houses compared to 7% of the stunted children from permanent owner-occupied houses although this relationship was not statistically significant.

There was no relationship between the type of house and the nutritional status of the school children on the variables of underweight, overweight and obese. The P value was more than 0.05 in all house-related variables.

Morbidity pattern and nutritional status of school children

Most of the households interviewed said they had access to affordable health facilities. There was no significant relationship between morbidity pattern and the nutritional status of school children (Table 4.27 and Appendix IV). The list in the table is from the highest prevalence. However, in the two weeks prior to the study 56% of the underweight children had been unwell compared to 44% of the underweight children who did not report sickness in the two weeks before the study.

Table4.27: Relationship between Morbidity Factors and Nutritional Status of the School Children (N=139)

	Nutritional Status of School Children		
Type of illness (Ranked from the highest prevalence)	**Stunting (H/A)**	**Underweight (W/A)**	**Overweight and obese (W/H)**
	P. value	P. value	P. value
Malaria	0.18	0.47	0.47
Diarrhoea	0.74	0.72	0.65
URTI	0.44	0.78	0.71
GIT	0.34	0.61	1.0
Skin	0.75	0.59	1.0

4.9.5 Food Consumption pattern and Nutritional Status of School Children

There was a significant relationship (p= 0.0001) between the consumption of snacks after supper and the nutritional status (stunting) of the school children. Children who ate snacks after supper were 5.17 times more likely to be obese. Conversely, those who did not eat snacks after supper were 6.88 times more likely to be underweight and 7.68 times more likely to be stunted compared to those who ate snacks after supper (Table 4.28).

Table 4.28: Relationship between eating snacks after supper and the nutritional status (stunting) of school children

Snack taken after supper	Nutritional status (Stunting)					
	Normal	Stunted	Total	$\chi 2$	P value	OR (95% CI)
Yes	17, (81%)	4, (19%)	21, (100%)	15.3%	0.0001	7.68 (2..5-23)
No	140, (37%)	253, (63%)	393, (100%)			
Total	157, (38%)	257, (62%)	414, (100%)			

Relationship between school lunch and nutritional status of school children

There was a significant relationship between availability of school lunch and the nutritional status (underweight) of school children. Children who were not provided with school lunch were 1.72 times more likely to be underweight than those who took school lunch. There was no relationship between school lunch and stunting and between school lunch and overweight and obesity among the school children.

Relationship between food groups and nutritional status of school children

Children whose school lunch contained less than three food groups were 16.7 times more likely to be underweight than those whose school lunch contained more than three food groups.

Summary of the factors having a significant influence on the nutritional status of the school child

Table 4.29: Factors that had a significant influence on the nutritional status of School Child's significantly (stunting)

Variable	Factor	p. Value	OR and CI
Social demographic factors	Mother educated	0.041	0.39, (0.2-0.9)
	Les educated care giver	0.00001	13.2, (7.7-22)
	House floor type (cemented)	0.038	0.62, (0.3-0.9)
Food security	Mother not main decision maker on amount to be spent on food	0.020	2.51, (1.1-5.6)
	Less than three meals per day	0.03	2.42, (1.3-4.4)
	Child missing food frequently	0.012	1.7, (1.1-2.6)
Food consumption pattern	Child not taking snack after supper	0.00001	7.68, (2.5-23)

Table 4.30: Summary of factors with a significant influence on the school child's nutritional status (underweight)

Variable	Factors	P value	OR and CI
Social demographic factors	Alternative care giver with no education.	0.026	1.89 (1.1-3.3)
	Father employed.	0.026	0.43, (0.2-0.9)
	Household member < 5	0.039	0.062 (0.3-0.9)
Household food security	Mother prepares food.	0.035	0.47 (0.2-0.9)
	Mother serves food to the child	0.027	0.40 0.2-0.9)
	Less than three meals per day	0.017	2.42 (1.2-5.1)
Environmental	Availability of toilet facility	0.037	0.37 (0.1-0.9
Food consumption pattern (child feeding)	Lunch not provided in school	0.043	1.72 (1.0-2.9)
	School lunch having less than three meals	0.0001	16.7, (6.1-45
	Children taking no snack after supper	0.000	6.88, (2.6-18)

Table 4.31: Summary of factors with a significant influence on school child's nutritional status (overweight and obese)

Variable	Factor	P value	OR and CI
Social demographic factors	Alternative care giver schooled	0.0001	4.20 (2.3-7.5)
Household food security	Mother mainly prepares the food	0.028	0.53 (0.3-1.1)
	Mother mainly serves the child	0.036	0.39 (0.2-0.9)
	Food never begged	0.029	0.59 (0.3-0.9
Food consumption pattern (child feeding factors)	Child took supper	0.049	1.0-10.6
	Child took snack after supper	0.0004	5.17, (1.9-14.1)

4.10 Results of Multiple Regressions

4.10.1 Adjusting for Confounding Factors and Testing for Effect Modification

The factors that were found to be associated with the three main study outcomes in the bivariate analysis were included in logistic regression analysis. Adjustment for age and sex was made for the associations observed between variables and the outcomes of interest namely, underweight, stunting and overweight. In addition, some socio-demographic factors like the person heading a household and the marital status of the mother were assumed to be confounders and adjusted for in the regression model. The study explored possible effect modification among the main exposure variables (age, sex, social demographic, morbidity, environmental, food consumption pattern and household food security) by performing likelihood ratio tests. However, no significant interactions were observed.

4.10.2 Statistical analysis - Logistic regression

Stunting

After adjusting for the effect of age and sex the associations observed in bivariate analysis between stunting in children and socio-demographic factors (maternal and caregiver levels of education, and floor type) were not significant. The results of the logistic regression for stunting and the other factors adjusted for are presented in Table 4.32. Comparing the crude odds ratios in bivariate and the adjusted estimates there was a significant confounding in the crude associations (Table 4.32)

Table 4.32: Logistic regression for stunting

Variable		Odds ratio	Std. Err.	Z	P value	95% Conf. Interval
Child's sex		1.60	0.95	0.80	0.426	0.50-5.10
Child's age	5-7	0.90	0.31	-0.31	0.759	0.43-1.83
	7-10	0.86	0.33	-0.38	0.701	0.41-1.83
decision maker on food bought		0.51	0.32	-1.08	0.279	0.15-1.74
Care giver level of education		0.76	0.24	-0.86	0.390	0.41-1.42
Head of the household		0.96	0.56	-0.07	0.945	0.31-3.02
Mother's marital status		1.52	0.58	1.10	0.272	0.72-3.19
No. of meals per day		1.31	0.44	0.80	0.426	0.67-2.54
Mother's education level		1.87	1.03	1.14	0.255	0.64-5.51
No. of days without food		1.50	0.40	1.55	0.121	0.90-2.52
Type of floor		1.22	0.34	0.72	0.473	0,71-2.11

Logistic regression for underweight

Only education level of the alternate care giver remained significantly associated with underweight after status logistic regression analysis. The odds of an underweight child having an alternate caregiver with formal education was approximately a third (OR=0.28(95% CI 0.12-0.65; P=0.003) that of a non-underweight child.

In the model, number of meals per day was also associated with underweight with an odds ratio of 4.2 (95% CI 1.11-16.05; P=0.035) (Table 4.33).

Table 4.33: Results of logistic regression for underweight

Variable		Odds Ratio	Std. Err.	P value	95% Conf. interval
Child's sex		0.89	0.51	0.84	0.29-2.71
Child's age	5-7	1.51	1.23	0.61	0.31-7.43
	7-10	1.15	0.96	0.87	0.22-5.87
Caregivers level of education		0.28	0.12	**0.003**	**0.12-0.65**
Mother's level of education		2.02	1.50	0.35	0.47-8.69
Number of meals per day		4.22	2.86	**0.035**	**1.11-16.05**
Food prepared by mother		0.60	0.43	0.47	0.15-2.42
Food served by mother		2.14	2.15	0.33	0.41-13.90
Borrows food at times		0.47	0.47	0.76	0.50-2.55

Logistic Regression for Overweight and Obesity

After adjusting for the effect of age and sex there was only one significant relationship between overweight and obesity and the study variables (Table 4.34). The number of meals per day was found to influence nutritional status of the children. Those school children who had less than three meals per day were found to be 69% less likely to be obese compared with those who took more than three meals per day.

Table 4.34: Logistic regression for Overweight and Obese

Variables		Odds Ratio	Std. Err.	P value	95% conf. Interval
Care giver level of education		1.05	0.62	0.928	0.33-3.33
	5-7	2.25	0.98	0.063	0.96-5.30
	7-10	1.15	1.01	0.877	0.20-6.45
Mother's education status		0.34	0.27	0.171	0.07-1.58
No. of household members		1.62	0.63	0.210	0.76-3.46
The mother is the one preparing the food		2.75	2.56	0.276	0.44-17.02
Lunch provided at school		1.15	0.49	0.739	0.50-2.65
Food served by mother		0.37	0.40	0.362	0.45-3.11
No. of meals per day		**0.31**	**0.14**	**0.009**	**0.13-0.75**

CHAPTER FIVE: DISCUSSION OF FINDINGS

5.1 Introduction

This chapter presents a discussion of the main findings of the study to investigate factors influencing the nutritional status of school children in Kieran Location.

5.2 Nutritional Status of School Children

Thirty five percent of the school children studied were stunted, 26% were underweight, 14% were thin, and 13% were overweight and obese. These findings seem to suggest deterioration in the nutritional status of school children compared to earlier studies. For instance, in 2005 the ACC/SCN reported that an estimated 32.5% of children in developing countries were stunted. A study done in Kieran showed that 15.8% of the children were stunted (Mugo 1991). Similar studies on school children have shown a continuous increase in malnutrition (especially stunting) although the problem is worse in pre-school children (United Nations 1998).

Malnutrition in school-age children is common in developing countries and includes both stunting and underweight. Stunting, which represents a chronic state of nutritional stress, leads to adverse health, educational, and cognitive effects (Martin 2006). The increasing levels of stunting could be attributed to high rates of rural to urban migration, increase in slum population, and poverty.

Whereas it is only children below the age of five who are generally considered as being nutritionally vulnerable, older school-age children may be equally vulnerable. This study found a higher incidence of stunting among children in the 5-7 years age group than in the 8-14 years age group. However, this result may have been influenced by the method of selecting the youngest child in households with more school-going children in the age bracket of interest rather than using random selection. A similar study done in Pakistan found that the prevalence of malnutrition was significantly higher among older children (Raheela et al 2002). In addition, it has been observed that children who are exposed to poor nutrition tend to be stunted throughout their school years (Lesley et al 2002 and CBS 1998).

In this study, girls were found to be more stunted, underweight, and wasted. This could be attributed to gender discrimination in some households where girls and their mothers eat last, which means that under conditions of food shortage girls do not eat at all. Girls are also not treated on time when they fall ill. A study done in Pakistan had similar results whereby among the school children, 61.8% of the girls were stunted, 84% were wasted, and 67.1% were underweight. This study also revealed a strong preference for sons leading to the neglect of female children. In addition, the study showed that boys were fed higher quality of food than girls, and also those girls and their mothers ate last because parents considered boys as a form of insurance in old age and thus fed them well and protected them from illness (Awan 2003).

5.2.2 Factors Influencing Nutritional Status of the School Children

Social Demographic Factors

Certain socio-demographic factors of the household were found to be strongly associated with malnutrition among the school children.

Mothers' education level

The findings that the mother's education level had no influence over the child's nutritional status were surprising but not unexpected in a study conducted within an urban setting because a study in Uganda (Kikafunda and Tumwine 2006) found similar results. Other studies have found a positive association between the mother's level of education and the nutritional status of the children. For example, a study in Sudan indicated that mothers with at least primary education were less likely to have malnourished children even after controlling for income and environmental conditions (Tanyi, 2006). Similar results were obtained in a study in Mali where stunting was strongly associated with the education level of the mother (Bouvier 2005). The parent's education impacts the nutritional status of the children through improvement of economic status, improved health knowledge, better health facility utilization, and improved child care skills (Kikafunda and Tumwine 2006).

Level of education of the care giver

This study found an association between the nutritional status (underweight) of the school children and the education level of the care givers. The level of underweight school children was higher in households where the alternative care giver had little education compared to those where the alternative care giver was educated. This could be explained by the fact that the educational status of the care giver is closely linked with the economic status of the household. Households that had uneducated care givers could not afford to pay for educated ones. There is evidence that school children under the care of older children or grandparents may have a compromised nutritional status. Elderly caregivers especially may find the task of looking after small children to be beyond the scope of their physical ability (UNICEF 2002).

Income and household size

Since access to food in the urban areas is largely dependent on income, the findings of this study departed from what would have been expected. This study did not show any significant relationship between household size, income, and the nutritional status of the school children. A study conducted in Pakistan under similar slum socio-economic conditions as those found in Kieran showed that household size had a negative and significant impact on child nutritional status. The study also showed that household income had an important and significant impact on child nutritional status (Azuma 2006).

Household Food Security

Food consumption frequency

The number of meals eaten per day had a significant influence over underweight and obesity among the school children. An interesting finding was that children who took less than three meals per day were 4.22 times more likely to be underweight and 69% less likely to be obese.

Food consumption pattern

The relationship between food group consumption and nutritional status has not been documented before in Kenya. This study found that the frequency of consumption of legumes was almost four times lower than the consumption of animal products. A probable reason for this observation could be that although the cost of buying legumes is lower than that of buying animal products, legumes take longer to cook and consume more fuel thus making them less popular among the households. A study carried out in Kieran showed similar results (Mugo 1991). Although this study showed no association between food groups consumed children and the nutritional status of the school children, a few studies have shown a positive relationship.

Environmental Factors (Water and Sanitation)

The physical growth of school children depends on the interaction between environmental and genetic factors. In this study, the environmental sanitation conditions of the households were generally poor especially along the roads but these did not seem to influence the nutritional status of the school children. This could be explained by the fact that school children from households that lacked water were at risk of water-related diseases like diarrhea and vomiting but this did not affect their health and food intake which can lead to malnutrition because of the households' access to health facilities. Although this study showed no association between environmental factors and the nutritional status of school children, a similar study has shown a positive relationship. In southern Sudan, a study found that children in households with unsafe sources of water were 2.6 times more likely to suffer from wasting than those with piped in/tube wells as their main source of water (Tanyi 2006).

Child Morbidity Factors, child care and Health Seeking Behaviour

Morbidity factors did not show any impact on child growth and nutritional status of the school children. This could be explained by the households' access to affordable health services. However, studies in different parts of the world have shown diarrhoea to have the most marked effect on anthropometric status and to negatively impact child growth.

Upper respiratory tract infections did not seem to affect growth but pneumonia and other lower respiratory tract infections have deleterious effects. In addition, malaria and measles have been associated with poor growth in school children while anti helmintic treatment has been shown to improve growth in the school child (Mclay 1995).

From bivariate analyses many variables were found to be significant, but after subjecting data to logistic regression analysis, they were found to have no significant effect. This may suggest presence of confounding in relationships observed during bivariate analyses.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The factors found to significantly affect the nutritional status of the school children were the level of education of the alternate care giver and food consumption and frequency patterns (frequency of meals per day).

Therefore, efforts towards alternate care giver education and a higher frequency of meal intake per day will have a positive impact on the nutritional status of the school child.

6.2 Recommendations

1. Nutritional status of the school children was mainly affected by the level of education of the alternate care giver and meal frequency. Therefore, there is need for further studies on school children to address these factors.
2. Nutrition programmes and healthcare providers in Kieran Location should provide health education to mothers about the importance of using educated alternate care givers to take care of their children. These programmes should also emphasise the need for a balanced diet and for mothers to give at least three meals per day to their children.
3. A national nutrition survey of school children would be important to establish the pattern of growth of school children. This can be done through the inclusion of school-age children in the Kenya Demographic Health Survey.

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APPENDICES

Appendix I: Questionnaire

Code number_____ Enumerator (name) _____

Date _____Village_____

1. Relationship of the respondent to child: Mother….. Father….. Grandparent…… Sibling…… Aunt/Uncle……. Other……..

2. Household composition:

Names of Household Members	Age (yrs)	Gender		Family Relationship to the Child*			
		M	F		CODE		

Relationship* Code* Yes No *Relationships (use the child as reference): Father (1), Mother (2), Sibling (3), Grandmother (4), Grandfather (5), Aunt (6), Uncle (7), Cousin (8), Friend (9), Other (10).

3. Marital status of mother (Tick one):

1	2	3	4	5	6	7	8
Unmarried	Married	Divorced	Separated	Widowed	Living together	Traditional marriage	Other specify

4 Education level of mother **(Tick one only)**	1 None	2 Primary school	3 secondary	4 College	5 university	6 Others/ specify
5. Mother's employment status	1	2	3	4	5	6

(Tick one only)	House wife by choice	unemployed	Self-employed	employed	Don't know	Others specify
6 Education level of caregiver (Tick one only)	1	2	3	4	5	6
	None	primary	secondary	College	university	Others /specify
7 Father's employment status (Can tick more than one)	1	2	3	4	5	6
	Unemployed	Self employed	Wage earner	Retired by choice	Others specify	Not applicable
8 How many people contribute to the total household income? (Tick one only)	1	2	3	4	5	6
	1 person	2 person	3-4 persons	5-6 persons	More than 6	

	1	2	3	4	5	6
9. Household income per month (Including wages, rent, sales of vegetable, etc.) (Tick one only)	Less than 1000	1000-4000	4001-7000	7001-10000	More than10000	Don't know

	1	2	
10. Is this the usual income of the Household? (Tick one box only) Yes No	YES	NO	If NO, what other income is available, specify.

11 Is this more or less than the income you have had over the past six Months? (Tick one only)	1	2
	YES	NO

12. How much money is spent on food weekly? (Tick one only)	1	2	3	4	5	6	7
	<1000	1001-2000	2001-4000	4001-6000	6001-8000	More than 10000	Don't know

Tick one block only for every question:	Father	Mother	Sibling	Grandma	Grandpa	Aunt	Uncle	Cousin	Friend	Other
13 Who is mainly responsible for food preparation in the house?	1	2	3	4	5	6	7	8	9	10

14 Who decides on what types of food to buy for the household?	1	2	3	4	5	6	7	8	9	10
15. Who is mainly responsible for serving the child?	1	2	3	4	5	6	7	8	9	10
16. Who is the head of this household?	1	2	3	4	5	6	7	8	9	10
17. Who decides how much is spent on food?										

When the child gets sick, where do you mainly seek medical care?

1. Hospital ☐
2. private clinic ☐
3. city council clinic ☐
4. Traditional health practitioners ☐
5. others (specify) _____

21. Are the healthcare services affordable to the child and other members of the household? (cost) (Y/N) _____

22. Are the healthcare services accessible? (Y/N) _____

23. How many meals does the child/household usually have in a day?

a. one ☐
b. two ☐
c. Three ☐
d. Yes ☐
e. more than three (specify)_____

24. How many days in a week on average do children/household do without food?

a. 1 ☐
b. 2 ☐
c. 3 ☐
d. others specify _____

25. a) Are there times when you get food on credit? (Y/N)

25 b) If yes, how many days on average in a week?

a. once ☐
b. twice ☐
c. others (specify)_____ ☐

26. a) Are there times when you borrow food? (Y/N) _____

26. b) from where do you borrow? (Tick all that are applicable)

a. neighbour ☐
b. friends ☐
c. relatives ☐
d. shop keeper ☐
e. Others (specify) _____

27. Where do you mainly get water from?

a. communal tap (for sale)
b. communal tap (free supply)
c. private (house hold tap)
d. others (specify) _____

28. Is the water always available from these sources?

a. Yes ☐
b. No ☐

29. How many litres of water does your household use per day? _____litres.

(You can estimate from the number of Jeri cans they buy per day or the 20 litre Jeri can.)

30. On average how much money do you spend on water per week? Ksh _____

31. a) Do you have a toilet facility? (Y/N) _____

32. What type of toilet facility do you have? _____

1. Pit latrine
2. Flying toilets
3. Flush toilets

33 b) Tick as appropriate regarding ownership of the toilet used by your household

a. communal ☐
b. private (house hold owned) ☐
c. others (specify) _____

34) Do you pay for usage of the toilet? (Y/N) _____

34 b) If yes how much do you (household) pay per day? Ksh _____

35 Are there cultural beliefs that you know of concerning food taboos and especially foods not eaten by children?

1. Yes_____
2. No _____

35b).Do you practice these food taboos on the child? (Y/N) _____

35c) if yes in question 35 specify which _____

Housing

36. Is this house your own or rented?

a. Own
b. Rented

37 How many rooms are in this house?

c. a). one
d. b). two
e. d).>two

38 a) Indicate the main material used to make the roof of your house.

1. Corrugated iron sheets
2. Polythene

3. Flattened tins
4. others (specify)

38. B) Indicate the main material used to make the walls of your house.

1. Bricks
2. Timber
3. Mud
4. Mud plastered
5. Corrugated iron sheets
6. Others (specify)

38 c) Indicate the type of floor finishing for your house.

a) Earth
b) Cemented

39Indicate the main type of fuel used in your house

c) Gas
d) Paraffin
e) Charcoal
f) Firewood
g) Others (specify)

Child's details

40. Age _____

41 Child's sex _____

42. Child's date of birth _____

	1st reading	2nd reading	Average
43. Weight (kg)			
44. Height (cm)			

45 a) Has the child suffered any illness in the last 2 weeks? (Y/N)_____

45 b) Which illness did the child suffer from?

1. Malaria
2. Diarrhoea
3. Measles
4. URTI
5. Dental carries
6. Measles
7. Others (specify)

46. Does the child suffer from any disability? (Y/N) _____

47. If Yes specify _____

48. Is lunch provided in school? Y/N_____

48 b) If Yes state foods given (Yesterday);

At break (snack)	At lunch

48 c) If No, does child carry food from home or money

1	2	3	4
Food always	Money always	Nothing	Food occasional

Food frequency and diversity checklists

49. During the previous 24-hour period, did the child or any of you in the household consume the following meals?

	Yes	No
a) Any meal before breakfast		
b) Breakfast		
c) Any food between breakfast and lunch		
d) Lunch		
e) Any food between lunch and Supper		
f) Supper		
g) Any food after supper		
Total		

49 b) Indicate how often the child feeds on foods from the food groups indicated and check foods consumed in the last 24 hours and the source.

Food	**Frequency**	**Food Consumed in the last 24 hour**		**Source**
		Yes	No	
Animal foods Beef/mutton/goat meat Chicken, Offal, Pork Fish, Eggs				
Milk/Milk products Fresh milk (pkt) Fresh milk (Hawked) Yoghurt, Mala				

Codes for Sources
1=Purchase from retail shop/kiosk
2=Purchased through Wholesale
3=Given/Donation
4=Own Produced
5=Other Specify

Codes for Frequency
1= Daily
2= 2 – 3 times/day
3= Once per week
4= 2 to 3 times per wee
5= > 3 times per week
6= Once per 2 weeks 7-
Once per month
8= Less once per month
9= others specify
10= Never

Fruits Paw paws/Apples Orange/lemon/passion Bananas/mangoes				
Nuts and Legumes Groundnuts, beans, Cowpeas, green grams, peas				
Vegetables Carrots, Cabbage, Dark green vegetables, Tomatoes				
Roots/tubers Arrowroots, Irish potatoes, Sweet potatoes				
Cereals Rice, Chapatti, Cakes/biscuits, Maize/Maize flour, Bread/scones				
Fats/Oils/margarine				
Others				

Appendix II: Informed Consent Explanation Form

My name is Sarah Cherobon Tai, a postgraduate student in Public Health from Department of Community Health of the University of Nairobi. I am carrying out a study in Kieran Location. The purpose of the study is to investigate factors influencing the nutritional status of school children aged 5-14 years in Kieran Location. Findings of this study will help the authorities in planning and implementing nutrition programs for improvement of nutrition among this age group. In order to make this study successful, I would like your child to participate. If you agree, your child will be among 421 children in this area who will participate in this study. I will also need your cooperation in answering some questions.

It will take about 20 minutes for me to get answers to all my questions and you will be asked these questions only once. The participant (child) will also be weighed and his/her height taken. These measurements on the participant (child) will also be taken only once. They will not cause any pain or harm to the participant (child) in any way.

The information you give will be kept confidential but will be used anonymously for making known the findings to other scientists. You or the participant (child) will have no direct access to the results of the survey but you may contact the researcher on telephone number 0722 610 684 if you wish to know about the findings on the participant (child).

No pressure will be applied for you/the participant (child) to take part in this research. You can decline to participate or you can stop answering the questions at any time during the interview. Should this happen, you will not be disadvantaged in any way and it will not be held against you. Finally, participation in this research will have no costs for you /the participant (child).

I/the parent/guardian of the participant (child) hereby agree voluntarily to take part in this study.
Signed/confirmed by .....Date.....
(Participant's Signature or hand mark)

Appendix III: Bivariate Analyses

App. III Table 1 Association between social demographic variable and nutritional status of the child.

Social demographic Factors	Height for Age (stunting)					weight for age (under weight)					Weight for height (overweight)				
	Normal	(Stunted)	χ2	p-Value	OR	Normal	Under weight	χ2	p-Value	OR	Normal	Obese	χ2	p-Value	OR (95% CI)
Father H/H head	215 (64)	120 (36)	1.089	0.297	0 75 (0.4-1.2)	264	90	0.006	0.938	0.98 (0 6-1 7)	209	85	0.438	0.508	0 82 (0 4-1.5)
Father not H/H head	59 (70)	25 (30)				63	21				54	18			
Mother not married	37 (68.5)	17 (31.5)				38	16				38	9			
Mother schooled	250 (65.1)	134 (34.9)	4.17	**0.041**	**0.39 (0.2-0.9)**	20	10	0.897	0.344	0 68 (0 3-1 5)	246	94	0.776	0.378	1.49 (0 6-3 7)
Mother never schooled	28 (82 4)	6 (17.6)				287	98				14	8			
Other carer schooled	177 (86.3)	28 (13.7)	105 4	**0.000**	**13.2 (7.7-22)**	210	58	**4.95**	**0.026**	**1.89 (1.1-3.3)**	176	62	**25.16**	**0.000**	**4.20 (2.3-7.5)**
Other carer never school	45 (32 4)	94 (67 6)				48	25				25	37			
Mother employed	162 (66 9)	80 (33.1)	0.567	0.451	1.17 (0.8-1.8)	127	45	0 003	0.956	0.99 (0 6-1 5)	154	63	0.196	0.658	0 89 (0 6-1 4)
Mother not employed	109 (63.4)	63 (36.0)				180	63				106	39			
Father employed	252 (65.9)	130 (34 0)	0.439	0.508	1 29 (0.6-2 8)	17	13	**4.946**	**0.026**	**0.43 (0.2-0.9)**	217	86	1 178	0.278	1.58 (0.6-3 6)
Father not employed	18 (60)	12 (40)				288	95				16	10			
H/H members ≤5	163 (63 4)	94 (36.6)	1.14	0 286	0 79 (0.5-1.2)	180	77	**4.25**	**0.0393**	**0.62 (0.3-0.9)**	161	66	0 257	0.612	0 88 (0.6-1 4)
H/H members >5	111 (68.5)	51 (31 5)				129	34				102	37			
Monthly H/H income Ksh 0 – 4000	72 (67.3)	35 (32 7)	0 093	0 760	1.09 (0.6-1 9)	83	24	1 455	0.228	1.43 (0 8-2 6)	62	28	0.35	0 554	0 83 (0 5-1 5)
Monthly H/H income Ksh > 4000	87 (65.4)	46 (34 6)				94	39				85	32			
House Own	22 (62.8)	13 (37.1)	0 102	0.749	0.89 (0.4-1.8)	24	11	0.528	0 467	0.77 (0.4-1 6)	23	8	0 007	0 781	1.13 (0.5-2 6)
House rented	251 (65.5)	132 (34.5)				285	100				240	94			
Cemented floor	179 (62 2)	109 (37.8)	**4.319**	**0.038**	**0.62 (0.3-0.9)**	208	81	1.318	0 250	0 75 (0 4-1 2)	179	72	0 039	0.843	0 95 (0.6-1 6)
Earth floor	93 (72.7)	35 (27.3)				99	29				81	31			

Table 2. Association between house hold food security factors and nutritional status of the child

House hold food security Factors	Height for Age (stunting)					weight for age t (under weight)					Weight for height (overweight)				
	Normal	(Stunted)	χ2	p-Value	OR	Normal	Under weight	χ2	p-Value	OR	Normal	Obese	χ2	p-Value	OR (95% CI)
Amount spent on food weekly (Ksh) 0-2000	209	105	0.672	0.412	1.21 (0.8-1.9)	232	88	2.768	0.096	0.56 (0.3-1.1)	193	81	0.874	0.349	0.77 (0.4-1.3)
Amount spent on food > 2000	64	39				52	11				68	22			
Parent main decider on amount spent on food	136	230	**5.411**	**0.0200**	**2.51 (1.1-5.6)**	282	105	1.066	0.301	0.62 (0.2-1.5)	242	96	0.076	0.783	0.88 (0.4-2.5)
Parent not main decider on amount spent on food	8	34				26	6				20	7			
Mother mainly prepares food	229	127	1.193	0.275	0.723 (0.4-1.3)	257	100	**4.372**	**0.035**	**0.47 (0.2-0.9)**	217	93	**4.845**	**0.028**	**0.53 (0.3-1.1)**
Mother not mainly prepares food	45	18				58	11				48	11			
Mother main decider on food bought	237	130	0.87	0.351	0.74 (0.4-1.4)	266	102	2.539	0.111	0.55 (0.3-1.2)	226	94	1.914	0.166	0.58 (0.3-1.3)
Mother not main decider on food bought	37	15				43	9				37	9			
Mother mainly serves food to child	237	130	0.87	0.351	0.74 (0.4-1.4)	264	104	**4.86**	**0.027**	**0.40 (0.2-0.9)**	227	96	**4.398**	**0.036**	**0.39 (0.2-0.9)**
Mother not main server of food to child	37	15				44	7				36	6			
Number of meal per day< thrice	47	17	**8.571**	**0.003**	**2.42 (1.3-4.4)**	55	9	**5.711**	**0.017**	**2.42 (1.2-5.1)**	38	17	0.205	0.651	0.87 (0.5-1.6)
Number of meal per day ≥thrice	145	127				253	100				222	86			
Child go without food at times	123	47	**6.272**	**0.0120**	**1.7 (1.1-2.6)**	133	38	2.704	0.100	1.46 (0.9-2.3)	155	62	0.033	0.856	0.96 (0.6-1.5)
Child always has food	150	98				175	73				107	41			
Food obtained on credit at times	190	93	0.898	0.343	1.23 (0.8-1.9)	210	74	0.144	0.704	1.09 (0.7-1.7)	174	74	0.912	0.339	0.78 (0.5-1.3)
Food never obtained on credit	83	50				96	37				87	29			
Food borrowed at times	80	42	0.005	0.943	1.01 (0.7-1.6)	87	35	0.427	0.513	0.85 (0.5-1.4)	69	39	**4.716**	**0.029**	**0.59 (0.3-0.9)**
Food never borrowed	193	103				221	76				193	64			
Are there food taboos practiced	29	20	1.803	0.179	0.56 (0.2-1.3)	38	12	0.267	0.605	1.27 (0.5-3.1)	30	16	1.743	0.186	0.5 (0.2-1.4)
No food taboos practiced	36	14				35	14				32	9			

Table 3. **Association between house hold environmental factors and nutritional status of the child**

House hold environmental Factors	Height for Age (stunting)					weight for age (under weight)					Weight for height (overweight)				
	Normal	(Stunted)	χ2	p-Value	OR	Normal	Under weight	χ2	p-Value	OR	Normal	Obese	χ2	p-Value	OR (95% CI)
Private water source	2	5	* 2.596 (Yates)	*0.107	0.21 (0.0-1.1)	2	5	* 4.942 (Yates)	* 0.026	0.14 (0.0-0.7)	257	101	-	-	7.63 (0.8-74)
Communal water source	268	143				303	109				1	4			
Water always available	56	30	0 006	0.938	1.24 (0 8-2 0)	69	17	2.394	0.121	1.58 (0 9-2 8)	58	16	2 04	0.153	1.55 (0 8-2 9)
Water not always available	217	144				239	93				203	87			
water used litres/day ≤ 100	209	109	0.123	0 726	1 09 (0.7-1 8)	237	82	0 016	0.899	1.03 (0 6-1 8)	199	78	0.113	0 737	0.91 (0 5-1.6)
water used litres/day >100	58	33				67	24				59	21			
water bought ksh/day ≤ 100	123	65	0 011	0.916	1.02 (0.7-1.5)	146	43	1.425	0 233	1 32 (0 8-2 1)	125	40	1.22	0 269	1.31 (0 8-2 1)
water bought ksh/day> 100	137	74				152	59				129	54			
H/H Toilet facility available	246	131	0.081	0 776	0 90 (0.5-1 8)	273	105	4.354	0.037	0.37 (0.1-0.9)	237	92	0.187	0 665	1.18 (0.6-2 5)
H/H toilet facility not available	27	13				35	5				24	11			
Flash/Pit toilet	267	140	*0 295 (Yates)	*0.587	1.91 (0.5-7.7)	301	107	*0 709	*0.399	2.25 (0.6-8 5)	257	98	*1.68 (Yates)	*0 194	3 49 (0 8-15)
Non Flash /Pit toilet	4	4				5	4				3	4			
Toilet private own	16	6	0 543	0.461	1.43 (0.5-3.7)	18	4	*0 437	0.509	1 66 (0 5-5.0)	17	3	*1 1 (Yates)	*0 294	2 25 (0 6-7 9)
Toilet communal	255	137				287	106				244	97			
Pay to use toilet	63	44	2.551	0 110	0.69 (0 4-1.1)	83	24	1.179	0.278	1.33 (0 8-2 2)	69	21	1.101	0 294	1.34 (0 8-2 3)
Don't pay for toilet use	203	98				218	84				188	77			
Paraffin /charcoal main fuel	269	144	*0.013 (Yates)	*0.909	0 62 (0 1-6.0)	305	109	0 248	0 618	2.79 (0 3-20)	260	101	* 0.702 (Yates)	*0.402	5.15 (0.5-57)
Gas main fuel	3	1				2	2				1	2			

Table 4. **Association between child illness factors and nutritional status of the child**

Child illness factors	Height for Age (stunting)					weight for age (under weight)					Weight for height (overweight)				
	Normal	(Stunted)	χ^2	p-Value	OR	Normal	Under weight	χ^2	p-Value	OR	Normal	Obese	χ^2	p-Value	OR (95% CI)
Child illness 2 months prior to study	129	64	0.33	0.566	1.23 (0.8-1.7)	143	50	0.05	0.823	1.05 (0.8-1.6)	122	51	0.29	0.590	0.88 (0.6-1.4)
child not ill 2 months prior to study	145	81				166	61				141	52			
Mother ill 2 months prior to study	119	66	0.056	0.813	0.95 (0.6-1.4)	130	55	1.704	0.191	0.75 (0.5-1.2)	113	46	0.101	0.751	0.93 (0.6-1.5)
Mother not ill 2 months prior to study	144	76				168	53				143	54			
Father ill 2 months prior to study	63	34	0.014	0.906	0.97 (0.6-1.6)	70	27	0.068	0.794	0.93 (0.6-1.6)	56	29	0.946	0.330	0.77 (0.5-1.3)
Father not ill 2months prior to study	168	88				189	68				161	64			
Alternative care taker ill 2 wks prior to study	3	5	*1.02 (Yates)	*0.31	0.2 (0.0-1.7)	7	1	-	-	2.33 (0.2-32)	6	1	-	-	2.4 (0.2-34)
Alternative care taker not ill prior to study	6	2				6	2				5	2			
public facility Main place for child medical care	122	73	1.112	0.291	0.79 (0.5-1.2)	143	53	0.569	0.450	1.19 (0.8-1.9)	123	46	1.716	0.190	1.38 (0.9-2.2)
Private facility main place for child medical care	114	54				106	47				97	50			
Health services accessible	221	111	1.061	0.303	1.30 (0.8-2.1)	241	91	0.606	0.436	0.79 (0.5-1.4)	202	87	1.599	0.206	0.68 (0.4-1.2)
Health services not accessible	49	32				63	19				55	16			
Health services affordable	239	133	2.01	0.156	0.3-1.2	270	103	1.793	0.181	0.58 (0.3-1.3)	230	93	0.698	0.403	0.72 (0.3-1.6)
health services not affordable	33	11				36	8				31	9			

Table 6. Association between child feeding patterns factors and nutritional status of the child

Child feeding patterns Factors	Height for Age (stunting)					weight for age (under weight)					Weight for height (overweight)				
	Normal	Stunted	χ^2	p-Value	OR	Normal	Under weight	χ^2	p-Value	OR	Normal	Obese	χ^2	p-Value	OR (95% CI)
Child is schooling	264	135	1.471	0.2251	1.76 (0.7-4.4)	294 (73.5)	106 (26.5)	0.022	0.882	0.92 (0.3-2.6)	251 (71.7)	99 (28.3)	0.114	0.735	1.15 (0.3 – 3.4)
Child not schooling	10	9				15 (75)	5 (25.0)				11 (68.8)	5 (31.2)			
Lunch provided at school	212	105	0.097	0.7555	1.08 (0.7-1.8)	241 (75.8)	77 (24.2)	**4.102**	**0.043**	**1.72 (1.0-2.9)**	199 (72.6)	75 (27.4)	0.161	0.688	1.12 (0.6 – 1.9)
Lunch not provided at school	54	29				51 64.6)	28 (35.4)				52 (70.3)	22 (29.7)			
Food at break in school	165	82	0.492	0.483	0.80 (0.4-1.5)	47 (74.6)	16 (25.4)	0.15	0.698	0.88 (0.5-1.7)	156 (73.2)	57 (26.7)	0.015	0.902	0.96 (0.4 – 1.9)
Foot not given at break in school	45	18				190 (76.9)	57 (23.1)				40 (74.1)	14 (25.9)			
School lunch has 3 main food groups	23	6	2.127	0.144	1.98 (0.8-5.0)	24 (82.8)	5 (17.2)	**48.51**	**0.000**	**16.7 (6.1-45)**	18 (66.7)	9 (33.3)	0.644	0.422	0.707 (0.3 – 1.7)
School lunch has less than 3 main food groups	188	97				68 (22.3)	237 (77.7)				181 (73.9)	64 (26.1)			
Child eat lunch from home	45	25	0.036	0.849	1.25 (0.3-3.8)	47 (67.1)	23 (32.9)	0.853	0.356	1.75 (0.5-5.8)	44 (66.7)	22 (33.3)	0.312	0.576	1.4 (0.4 – 5.0)
Child each lunch bought in restaurant	8	5				7 (53.9)	6 (46.1)				7 (58.3)	5 (41.7)			
Child ate break fast yesterday	259	137	0.014	0.905	0.95 (0.4-2.4)	289 (72.8)	108 (27.2)	* 1.11	*0.292	0.45 (0.1-1.5)	249 (71.9)	97 (28.1)	0.237	0.626	1.28 (0.4 – 3.5)
Child did not eat break fast yesterday	14	7				18 (85.7)	3 (14.3)				12 (66.7)	6 (33.3)			
Child ate lunch yesterday	247	134	0.457	0.499	0.77 (0.4-1.7)	280 (73.3)	102 (26.7)	0.001	0.974	0.99 (0.4-2.1)	243 (72.8)	91 (27.2)	1.85	0.173	1.73 (0.8 – 3.8)
Child did not eat lunch yesterday	24	10				25 (73.5)	9 (26.5)				17 (60.7)	11 (39.3)			
Child ate supper yesterday	270	140	-	-	2.57 (0.6-11)	302 (73.5)	109 (26.5)	* 0.09	*0.75	1.10 (0.2-5.8)	256 (72.5)	97 (27.5)	**3.852**	**0.049**	**3.17 (0.9 – 10.6)**
Child did not eat supper yesterday	3	4				5 (71.4)	2 (28.6)				5 (45.5)	6 (54.5)			
Child ate snack after supper	17	4	**15.37**	**0.000**	**7.68 (2.5-23)**	15 (71.4)	6 (28.6)	**19.4**	**0.000**	**6.88 (2.6-18)**	12 (66.7)	6 (33.3)	**12.3**	**0.0004**	**5.17 (1..9 – 14.1)**
Child did not eat supper	140	253				105 (26.6)	289 (73.4)				96 (27.9)	248 (72.1)			

Appendix IV: Relationship between Morbidity and Nutritional Status of Children

Table 1: Relationship between malaria and stunting

Type of illness	Normal	Stunted	Total	χ2	P value
With malaria	255 (64.5%)	140 (35.5%)	395 (100%)	2.1	0.14
No malaria	19 (79.2%)	5 (20.8%)	24 (100%)		
Total	274 (65.4%)	145 (34.6%)	419 (100%)		

Table 2: Relationship between diarrhoea and stunting

Type of illness	Normal	Stunted	Total	χ2	P value
With diarrhoea	268 (65.5%)	141 (34.5%)	409 (100%)	0.13	0.7
No diarrhoea	6 (60%)	4 (40%)	10 (100%)		
Total					

Table 3: Relationship between URTI and stunting

Type of illness	Normal	Stunted	Total	χ2	P value
With URTI	223 (66.4%)	113 (33.6%)	336 (100%)	0.7	0.39
No URTI	51 (61.45%)	32 (38.5%)	83 (100%)		
Total	274 (63.4%)	145 (34.6%)	419 (100%)		

Table 4: Relationship between GIT and stunting

Type of illness	Normal	Stunted	Total	χ2	P value
With GIT	272 (65.7%)	142 (34.3%)	414 (100%)	1.44	0.23
No GIT	2 (40%)	3 (60%)	5 (100%)		
Total	274 (65.4%)	145 (34.6%)	419 (100%)		

Table 5: Relationship between skin problem and stunting

	Normal	Stunted	Total	χ2	P value
With skin problem	266 (65%)	142 (34.8%)	408 (100%)	0.27	0.60
No skin problem	8 (72.7%)	3 (27.3%)	11 (100%)		
Total	274 (65.4%)	145 (34.6%)	(100%)		

Table 6: Relationship between malaria and underweight

Type of illness	Normal	Under weight	Tota l	χ2	P value
With malaria	293 (74%)	103 (26%)	396 (100%)	0 62	0 43
No malaria	16 (66.7%)	8 (33.3%)	24 (100%)		
Total	309 (73 4%)	111 (26.4%)	420 (100%)		

Table 7: Relationship between diarrhoea and underweight

Type of illness	Normal	Under weight	Total	χ2	P value
With diarrhoea	302 (73.7%)	108 (26.34%)	410 (100%)	0.06	0 80
No diarrhoea	7 (70%)	3 (30%)	10 (100%)		
Total	309 (73.6%)	111 (26 4%)	420 (100%)		

Table 8: Relationship between URTI and underweight

Type of illness	**Normal**	**Under Weight**	**Total**	**χ2**	**P value**
With URTI	249 (73.89%)	88 (26.11%)	337 (100%)	0.089	0.77
No URTI	60 (72.3%)	23 (27.7%)	83 (100%)		
Total	309 (73.6%)	111 (26.43%)	420 (100%)		

Table 9: Relationship between GIT and underweight

Type of illness	**Normal**	**Under weight**	**Total**	**χ2**	**P value**
With GIT	306 (73.7%)	109	415(100%)	0.47	0.49
No GIT	3 (60%)	2 (40%)	5 (100%)		
Total	309 (73.57%)	(26.43%)	420 (100%)		

Table 10: Relationship between skin problems and underweight

Type of illness	**Normal**	**Under weight**	**Total**	**χ2**	**P value**
With Skin problems	301 (73.6%)	108 (26.4%)	409 (100%)	0.004	0.9
No Skin problems	8 (72.7%)	3 (27.3%)	11 (100%)		
Total	309 (73.6%)	111 26.4%)	420 (100%)		

Table 11: Relationship between malaria and overweight and obese

Type of illness	Normal	Over weight and obese	Total	χ2	P value
With malaria	299 (86 7%)	46 (13.3%)	345 (100%)	0 015	0 9
No malaria	18 (85 71%)	3 (14.29%)	21 (100%)		
Total	317 (86.71%)	49 (13.39%)	366 (100%)		

Table 12: Relationship between GIT overweight and obese

Type of illness	Normal	Over weight and obese	Total	χ2	P value
With GIT	312 (86 43%)	49 (13.57%)	361 (100%)	0.78	0 38
No GIT	5 (100%)	0. (0%)	5 (100%)		
Total	317 (86 61%)	49 (13.39%)	366 (100%)		

Table 13: Relationship between diarrhoea and overweight and obese

Type of illness	Normal	Over Weight and obese	Total	χ2	P value
With diarrhoea	309 (86 55%)	48 13.45%)	357 (100%)	0 413	0 84
No diarrhoea	8 (88 89%)	1 (11.11%)	9 (100%)		
Total	317 (86.61)	49 (13 39	366 (100%)		

Table 14: Relationship between URTI and overweight and obese

Type of illness	Normal	Over weight and obese	Total	χ2	P value
With URTI	253 (86.94%)	38 (13.06%)	291 (100%)	0.13	0.715
No URTI	64 (85.33%)	11 (14.67%)	75 (100%)		
Total	317 (86.61%)	49 (13.39%)	366 (100%)		

Table 15: Relationship between skin problem and overweight and obese

Type of illness	Normal	Over Weight and obese	Total	χ2	P value
With skin problem	309 (86.55%)	48 (13.45%)	357 (100%)	0.41	0.83
No skin problem	8 (88.89%)	1(11.11%)	9 (100%)		
Total	317 (86.61%)	49 (13.39%)	366 (100%)		

Appendix V: Relationship between Gender and Nutritional Status of Children

Table 1: Relationship between gender and stunting

Child sex	Normal	stunting	Total	X2	P value
Male	112 (61.88%)	69 (38.12%)	181 (100%)	1.90	0.17
Female	160 (68.88%)	74 (31.62%)	234 (100%)		
Total	272 (65.54%)	143 (34.46	415 (100%)		

Table 2: Relationship between gender and underweight

Child sex	Normal	Under Weight	Total	X2	P value
Male	131 (72%)	51 (28%)	182 (100%)	0.30	0 59
Female	174 (74 36%)	60 (25.64%)	234 (100%)		
Total	305 (73.32%)	111 (26.68%)	416 (100%)		

Table 3: Relationship between gender and overweight and obese

Child sex	Normal	Over weight and obese	Total	X2	P value
Male	142 (85.03%)	25 (14 97%)	167 (100%)	0.82	0.36%
Female	173 (88.27	23 11.73	196 (100%)		
Total	315 (86.78%)	48 (13.22%)	363 (100%)		

Appendix VI: Relationship between Age and Nutritional Status of Children

Table 1: Relationship between age and stunting

Child's age	Normal	Stunting	Total	$\chi 2$	P. value
5-7	138 (65.71%)	72 (34.29%)	210 (100%)	0.04	0.98
8-10	94 (65.28%)	50 (34.72%)	144 (100%)		
11-14	40 (66.67%)	20 (33.33%)	60 (100%)		
Total	272 (65.70%)	142 (34.30%)	414 (100%)		

Table 2: Relationship between age and underweight

Child's age	Normal	Underweight	Total	$\chi 2$	P. value
5-7	140 (66.67%)	70 (33.3%)	210 (100%)	11.18	0.004
8-10	113 (78.47%)	31 (21.53%)	144 (100%)		
11-14	52 (85.25%)	9 (14.75%)	61 (100%)		
Total	305 (73.49%)	110 (26.51%)	415 (100%)		

Table 3: Relationship between age and overweight and obese

Child's age	Normal	Overweight and obese	Total	$\chi 2$	P. value
5-7	172 (83.50%)	34 (16.50%)	206 (100%)	4.6	0.09
8-10	119 (90.84%)	12 (9.16%)	131 (100%)		
11-14	25 (92.59%)	2 (7.41%)	27 (100%)		
Total	316 (86.81%)	48 (13.19%)	364 (100%)		