CONTRIBUTION OF SCHOOL LUNCH TO DIETARY DIVERSITY AND ADEQUACY OF NUTRIENTS AMONG PRIMARY SCHOOL CHILDREN DURING RAMADHAN IN KISAUNI DISTRICT, KENYA

BY

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Declaration

I hereby declare that this dissertation is my original work and has not been presented for a degree in any other university.

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We confirm that the work reported in this dissertation was carried out by the candidate under our guidance and has been submitted for examination with our approval as University supervisors.

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Dedication

This work is dedicated to my loving parents; Margaret Mumbi Nzioka and the Late Daniel Musyoka Kavoi without whom, I most likely would not have come this far. You have been a pillar of love, support and encouragement throughout my life. I love you very much and I am forever grateful to you.

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Acronyms and Abbreviations

ACC: Administrative Committee on Coordination

CBS: Central Bureau of Statistics

CDC: Centres for Disease Control

CSB: Corn Soya Blend

DDS: Dietary Diversity Scores

FCI: Food Corporation of India

FCT: Food Composition Tables

FFQ: Food Frequency Questionnaire

FGD: Focus Group Discussions

FTC: Feed the Children International

GCNF: Global Child Nutrition Foundation

GoK: Government of Kenya

IFPRI: International Food Policy Research Institute

Hb: Haemoglobin

HDDS: Household Dietary Diversity Score

HH: Household

KDHS: Kenya Demographic Health Survey

MAR: Mean Adequacy Ratio

MEO: Municipal Education Officer

MDM: Mid Day Meal

NAR: Nutrient Adequacy Ratio

RDA: Recommended Dietary Allowances

SCN: Sub Committee on Nutrition

SES: Socioeconomic Status

SLP: School Lunch Program

SMP: School Milk Program/School Meal Program

SPSS: Statistical Package for Social Sciences

UN: United Nations

USDA: United States Department of Agriculture

WFP: World Food Program

WHO: World Health Organization

Operational Definitions

Anthropometry: physical measurements of the children's weight and height

Child dietary diversity: The number of different food groups consumed over a given reference period by the index child e.g. 24hours or 7 days.

Corn Soya Blend: Fortified flour provided by WFP for making porridge

Dietary diversity score: The number of food groups consumed over a reference period by the index child. This study used a score of 12.

Expanded or emergency school meal program: is a short term arrangement that may be brought about by increased levels of drought throughout the country. It targets drought areas and is based on geographic targeting.

Household measures: equipment used in the households to measure foodstuff either during preparation or consumption which include cups, bowls, spoons etc.

Mean adequacy ratio: the sum of all the nutrient adequacy ratios of the nutrients of interest divided by the total number of nutrients.

Nutrient adequacy ratio: the ratio of the children's daily intake to the current recommended allowance for their sex and age categories.

Nutrient adequacy: The achievement of recommended intakes of energy and other nutrients

Recall Period: the number of days required to reflect individual food consumption

Recommended dietary allowances: The average daily amount of a nutrient considered adequate to meet the known nutrient needs of practically all healthy people.

Regular school meal program: a prolonged feeding program which runs for a period of about 10 years.

Respondents: parents and primary school children aged between 6 to 18 years who are pupils in the selected schools.

School feeding: The provision of food to children while attending school through a program arranged by the school.

Abstract

Hunger and malnutrition among children in developing countries are major contributors to impairment of health, quality of life, and survival. Adequate nutrition of school children ensures growth to full potential, and provides the stepping stone to a healthy life. For food to provide nutrients to meet children's requirements, it has to be served in portions that are sufficient for their age, activity level and body weight. The present study was designed to establish the contribution of school lunch to dietary diversity and adequacy of nutrients in primary school children. It also investigated how much the portion sizes served contribute to the children's RDA.

A cross sectional study with a retrospective component was carried out between August and October 2010 in Kisauni District of Mombasa County. Two schools; one with a school meal program and one without, were selected for the study. Since all schools in the district had been in the program at one time, a school was selected that had been out of the program for about a year. Height and weight measurements of 191 school children were taken and their socio-demographic characteristics determined using a structured questionnaire. BMI for age and stunting indices were calculated from the data.

Dietary intake data was acquired using food frequency questionnaires, 24-hour recall and a dietary diversity questionnaire comprising 8 food groups. Protein, zinc, iodine, iron and vitamin A were the nutrients on focus. Statistical data analysis was carried out using SPSS v16, WHO AnthroPlus v3.1.0, Stata version v9, Excel 2007 and Nutrisurvey 2007 and student's t test. Descriptive statistics, Chi squares, Odds ratios and Univariate logistical regression were performed with a P-value ≤ 0.05 considered statistically significant.

Prevalence of underweight was 6.3% (program school) and 8.6% (non program school). The prevalence of global acute malnutrition was 16.3% in the program school and 13.6% in the non program school area. The mean dietary diversity score was 6 for each school and there was no difference between the schools using t test. The school lunch's contribution to RDA was highest in Vitamin A-96% and lowest at iron-8.7%. The meal contributed more to energy and nutrients when the children were on holiday tuition. The school lunch provided an average of 560.5 Kcal, 10.8g of protein, 1 mg of iron, 1735 μg of Vitamin A, 1.16mg of Zinc and 10.6 μg of iodine. The average expected proportion of intake for the children participating in a meal program was 703.5 Kcal, 12.6 g of protein, 3.7 mg of iron, 600 μg of Vitamin A, 2.7 mg of Zinc and 40 μg of iodine.

The school meal was found significantly able to meet the children's vitamin A RDA, a nutrient that was deficient in their home diet while the food portions served to the children were found to be inadequate. The school meal's contribution to the children's dietary diversity was one extra food group which placed them at an advantage compared to their Non SMP counterparts.

This study recommends that the SMP school comes up with a standardised way of serving food portions to the children if they are to meet the energy and nutrient requirements they are supposed to. WFP and policy makers ought to collaborate in designing school meal programs with a nutrition component in mind in order to improve the nutrient adequacy of the school meal and to review the food provided as lunch at school if the children's diet diversity is to be increased through the meal.

CHAPTER 1

1.0 Introduction

Nutrition is a key pillar of human life, health and development, throughout the entire lifespan. From the earliest stages of foetal development, at birth and throughout infancy, childhood, adolescence and adulthood, proper food and good nutrition are essential for survival, physical growth, mental development, performance, productivity, health and well-being (Matsoai, 2005).

Adequate nutrition of school children ensures they grow to their full potential, and provides the stepping stones to a healthy life. Poor nutrition compromises the quality of life of school children and their potential to benefit from education. School children grow significantly at a slower rate than pre-schoolers whilst being very physically active. As a result, their nutritional needs are high and critical. In principle, nutritional problems in the school child may carry into adulthood (Virtual Medical Centre, 2010).

Optimum diets provide all vital nutrients in recommended amounts for an individual's age and body size. Proper nutrition is vital for school children as during this phase nutritional problems originating earlier in life can potentially be corrected while current ones can be addressed. This age can therefore be considered a window of opportunity during which children are being prepared for a healthy adult life. It is also a suitable period to shape and reinforce healthy eating and lifestyle behaviours in order to prevent or postpone the onset of nutrition related chronic diseases in adulthood (Matsoai, 2005).

Good health and adequate nutrition promote both physical growth and learning. School children can benefit considerably from nutrition and health interventions. School feeding programs are one of several interventions that can address some of the nutrition and health problems of school children. The World Bank identified that school based health and nutrition programs are remarkably equitable and cost effective interventions contributing to human capital and social capital development (ACC/SCN, 1998).

Poor health and nutrition compromise both the quality of life of school children and the potential to benefit fully from the education they receive. Meeting the nutrition and educational needs of children is critical to supporting their healthy growth and development (Cataldo et al, 2003). The steady growth of children necessitates a gradual increase of nutrients. To provide all the needed nutrients, a child's meals and snacks should include a variety of foods from each food group in adequate amounts suited to the child's appetite and nutritional needs. The challenge is to deliver nutrients in the form of meals that are both nutritious and appealing to children (Cataldo et al, 2003).

According to Grantham-McGregor (1995), Hunger and malnutrition among children in developing countries are major contributors to the impairment of health, quality of life, and survival. Poor height for age, poor weight for age, iron deficiency anaemia, iodine deficiency disorders and vitamin A deficiency are the main nutritional problems facing school children. School children, who suffer from severe malnutrition exhibit significantly compromised reasoning and perceptual functioning, poorer school grades, reduced attentiveness and unresponsive play behaviour, as compared to their adequately nourished peers (Grantham-McGregor, 1995).

School children who are stunted are likely to have been exposed to poor nutrition since early childhood. The degree of stunting tends to increase throughout the school years. Interventions in school children can supplement efforts in the preschool years to reduce levels of stunting and related effects on children's health and education. Underweight among school children, as observed for stunting also reflects pre-natal under-nutrition, deficiencies of macronutrients and micronutrients, infection and, possibly, inadequate attention by caregivers. However, the prevalence of wasting which reflects acute malnutrition in school children is not as common as stunting or underweight (ACC/SCN, 2002).

School meals are important because they are one of the most obvious instruments for policy intervention in children's diet. School meals provide a direct way for policy-makers to reduce gaps in diet between children from more privileged and less privileged socio-economic backgrounds. School meals are now more important than in the past, since children these days seem to rely more on food provided at school than three decades ago (Belot and James, 2009).

1.1 Problem statement and study justification

As asserted by Cataldo et al. (2003), of all population groups, children are the most seriously affected by malnutrition. This includes children in the age category being studied in the current research and validates their investigation. Furthermore, for many decades, children aged 6-18 years have been neglected and for some, deficits in their nutritional wellbeing are brought about by poor access to food, health care, as well as a poor home environment (ACC/SCN, 2002).

School meals go a long way in influencing the nutrition status of children. School based meals in primary schools should contribute significantly to the augmentation of energy, protein and micronutrient requirements of children's meals (CDC, 1996). School meal programs were introduced to the public primary schools of Mombasa County in March 2009. Since then; no study had been carried out to establish the contribution of the school meal to the children's diet. Therefore the current study sought to assess this.

It is necessary that school meals contribute adequately to the nourishment of the growing child. When children are well nourished during primary school, it is more likely that they will be healthier and more productive during their future working years (ACC/SCN, 2002). During food service, the researcher observed that food portions served to the children were similar regardless of age, sex, activity levels and body weight. This led to the presumption that the school feeding programs might not improve the children's nutritional requirements as adequately as required. This meant that the program may not encompass at least a third of the daily meal that the lunch meal was supposed to cater for.

The daily meal mixed with oil and salt is estimated to provide the children with 703.25 calories, 13.5 grams of protein and 5 grams of fat on average (Lambers, 2009b). It was necessary to substantiate to what extent this was factual in the Kisauni District. It was also not clear to what extent the school meal contributed to the iron, iodine, zinc and vitamin A intake of the children's diet. It was therefore important to explore these areas.

The current study therefore aimed to investigate how sufficiently the school feeding program contributed to the children's nutritional requirements and to assess the contribution of the school lunch meal to the dietary intake and diversity of the school children's diet.

1.2 Aim of study:

To contribute towards the improvement of school children's nutritional status through well planned school lunch programs and to provide information on the contribution of school meals towards children's RDA in Kisauni.

1.3 Purpose of study:

This study was expected to promote the improvement of dietary adequacy and diversity of lunch meals provided to children through school meal programs in Kisauni District.

1.4 Objectives

1.4.1 Overall objective

To assess the contribution of school lunch to dietary diversity and adequacy of energy, protein, vitamin A, iron, zinc and iodine among children in a school feeding program compared with those not in one.

1.4.2 Specific objectives

1. To determine and compare the socio-economic and demographic characteristics in the households of children in a school with a feeding program and one without.
2. To assess the factors associated with children's poor nutritional status and the association to illness in a school providing lunch compared with one that does not.
3. To establish the contribution of the school meal towards energy, protein, Vitamin A iron, zinc and iodine in the children's diet.
4. To assess the dietary diversity and nutrient adequacy of children in a school feeding program while comparing them to those not in a school feeding program.

1.5 Research questions:

1) Is there a relationship between the socioeconomic and nutrition status of children in a school feeding program compared with those not in one?
2) Is there a relationship between the socio-demographic characteristics of the children in the two schools and their dietary diversity?
3) Is the nutritional status of the two groups of study children the same?

4) What is the contribution of the school lunch towards the children's recommended intakes of energy, protein, Vitamin A, iron, zinc and iodine?

1.6 Limitations:

The following limitations were encountered during this study:

1. Some of the children studied obtained their food from other sources apart from school or home.
2. Some of the relevant authorities declined to cooperate during the study period.
3. The study funding was delayed and the study did not begin as scheduled.

CHAPTER 2

2.0 Literature review

2.1 Nutrition among school children

School children are particularly vulnerable to under-nutrition because the priority in nutrition interventions is often to prevent malnutrition during foetal development and the first years of life. This is considered the most critical period for growth and development (Bundy et al, 2009). Under-nutrition represents both a cause and consequence of poor human health, development, and achievement across the lifespan (West et al, 2006). It is commonly reflected in a high prevalence of wasting, stunting, and micronutrient deficiency (Bundy et al, 2006).

Stunting, or low height for age, is a physical indicator of chronic or long-term malnutrition, whereas wasting or underweight (low weight for age) is an indicator of both chronic and acute malnutrition (Bundy et al, 2006). Both are widespread in school children in developing countries. Most common, are less apparent forms of undernourishment with respect to energy, protein, and micronutrient deficiencies that can adversely affect child growth, development, life quality, resistance to infection, and chances of survival (West et al, 2006).

2.2 School feeding programs

School feeding offers an excellent opportunity for school children as a means for enhancing nutrition and improving school attendance. It keeps children in school and supports learning by alleviating short-term hunger and improving health and cognitive abilities (Buhl, 2010). Though the feeding programs cannot reverse the consequences of earlier malnutrition, providing meals at school can have a significant impact on nutritional status and educational outcomes in children (Bundy et al, 2009, Bundy et al, 2006 and Kristjansson et al, 2007).

School feeding is a longstanding and popular development assistance program in low and middle income countries. The feeding programs are designed to provide food to hungry children and to improve their physical, mental and psychosocial health (Kristjansson et al, 2007). School Feeding Programs (SMPs) can motivate parents to enrol their children so that they attend school regularly, improve the nutritional status of the children over time, and alleviate short-term hunger in malnourished or otherwise well-nourished schoolchildren (Kazianga et al, 2008).

Other outcomes of school feeding include decreased morbidity, increased muscle mass, improved attention and behaviour and improved academic achievement. Improved attendance could mean greater opportunities for learning and mental stimulation and consequently, improved academic performance, more opportunities for social interaction with adults and peers, and possibly, a better attitude towards school (Kristjansson et al, 2007).

According to Musamali et al (2007), school lunches should provide a third of the RDA since lunch is one of the three main meals that a person is required to eat in a day. A good quality meal will improve nutritional status, which is vital for mental development and consequently academic performance. Kristjansson et al (2007), emphasize that, meal programs should be well-designed, to provide sufficient energy, protein, fat and micronutrient content based on the children's age and baseline nutritional status. Palatability and special needs of the target population are also extremely important. Food should be appealing, acceptable, and locally available.

Nutritional and health status have powerful influences on a child's learning and on how well a child performs in school. Malnourished or unhealthy children are unlikely to attend school regularly leading to poor academic performances. Children who are hungry have more difficulties concentrating and performing complex tasks, even if otherwise well nourished. Overall, SMPs can have a far reaching impact on children's nutritional and health status and how they perform in school (Kazianga et al 2008).

2.2.1 Nutritional content of school meals

Many WFP and government school feeding programs provide roughly one third of the energy requirements for school children as evidenced by programs in Kenya and Lesotho (Galloway et al, 2009). The daily meal, mixed with oil and salt, provides the children with 703.25 calories, including 13.5 grams of protein and 5 grams of fat necessary for their growth (Lambers, 2009). Parents and school communities are encouraged to provide vegetables or any other foods available in the community to supplement lacking nutrients e.g. fruits and vegetables to supply vitamins and minerals.

2.2.2 Shared experiences on school feeding

2.2.2.1 United Kingdom (UK)

All public schools offer school meals (about 45 percent of school children in primary and secondary schools eat school lunches every day). School meals are part of a means-tested program, such that children from less privileged backgrounds receive school meals for free. In 2006, around 18 percent of the pupil population was eligible for the free school meal program (Anderson and Butcher 2006).

2.2.2.2 United States of America (USA)

The National School Lunch Program is a federally assisted meal program that serves more than 101,000 public and non-profit private schools and residential child care institutions (USDA, 2007). The School Breakfast Program offers nutritionally sound breakfast programs to children in public and non-profit private institutions as well as child care centres. The USDA is the governing body for the National School Lunch and School Breakfast Programs (Dietary Guidelines Advisory Committee, 2000).

2.2.2.3 Thailand

The National School Lunch Program (SLP) was implemented according to the Royal Mandate of School Lunch Fund Act 1991, to manage nutritious lunch and decrease malnutrition. It runs parallel with the School milk program (SMP) which is the national supplementary food in school for growth promotion. Both programs cover all government primary schools and Day care centres over the country. The Main problem of the SLP quality is inadequate energy. Half of the rural school meals cannot meet four food groups. Few schools have standard menus or are concerned about the nutrition content of the meal (Chittchang, 2010).

2.2.2.4 India

The Government of India feeds approximately 120 million children a Mid Day Meal (MDM) each day. The MDM Scheme, run by the Ministry of Education through state agencies, is funded and operated as a partnership between the state and national governments. The central government provides staple grains and a cash subsidy per child. The bulk grains are provided through the Food Corporation of India (FCI), which provides 100 grams of cereals per child per day (450 calories), for a total of 2.6 million tons a year (Gustasfon, 2008). The Government of India has set nutrition standards for the minimum requirements of meals. According to the 2006 revised version of these regulations, meals must contain a minimum of 450 calories and 12 grams of protein each day, as well as meet minimum quantity requirements of certain micronutrients including iron, folic acid, and vitamin A (GoI, 2010).

2.2.2.5 Trinidad and Tobago

The government in Trinidad and Tobago has extended the coverage of free school meals to cover all government and government assisted (denominational) schools but not private schools. About 85,000 pupils in total, receive meals in primary, secondary and pre-school classes. Meals provided by the school nutrition programme are free of charge, and are supplied daily. In primary schools, teachers select children for free meals using guidelines provided by the Ministry of Education. Selection is based on the employment status of the parents, the number of children in the family, and whether the child has a specific medical condition (Gulliford et al, 2006).

2.2.2.6 Nepal

School feeding programs are considered vital to Nepal's recovery from a civil war and a series of natural disasters. World Food Program (WFP) provides fortified meals to 180,000 children in more than 2,200 schools in some of the most remote areas of Mid- and Far-Western Nepal. These areas are some of the poorest, most food-insecure communities where chronic malnutrition rates are as high as 60 percent. The school feeding programs serve as a magnet to draw children to school, improving their ability to learn and concentrate. They are an effective tool for increasing access to education and improving the nutritional status of children. (Lambers, 2009a).

2.2.2.7 Uganda

The government implements selective school feeding programmes with assistance from the WFP in the Districts of the North and North-eastern Uganda which are in a conflict situation and therefore needy. Karamoja Region has the lowest school enrolment and literacy rates that qualifies it for targeting with school feeding programs. School feeding in these Districts involves school management committees. Parents contribute firewood. School Feeding coverage in needy Districts is low and not all schools in each District or even sub-counties are covered. In most schools a hot breakfast and lunch is provided. WFP supplies assorted food items consisting mainly of maize meal, beans and vegetable cooking oil (GCNF, 2010).

2.2.2.8 Kenya

The World Food Program and the Kenyan Ministry of Education have been implementing school feeding in Kenya since 1980. The school meals programme in Kenya is one of the largest and most long-standing. The WFP-assisted school meals target all schools in the arid lands, the most vulnerable schools in semi-arid lands, and the informal urban slums in Nairobi and Mombasa (WFP, 2010a).

From 1999 onwards, the programme in Kenya expanded significantly, peaking at 1.85 million children in over 5,000 schools. This was in response to increased frequency of food crises resulting from drought, political violence and the introduction of free compulsory primary education in 2003. In 2008, the Government of Kenya took over responsibility for half the programme, while WFP focused on providing meals in primary schools in the most food insecure parts of the country (the ASAL's and urban slums of Nairobi & Mombasa) (WFP, 2010b).

The programs were introduced in the public primary schools of Mombasa in March 2009. Forty one primary schools were identified for the regular feeding program. Initially fifteen thousand, nine hundred and ninety five (15,995) pupils benefited from the program. Thirteen other schools were also selected to benefit under the emergency program. This was a short term program that commenced in March 2009 and was to run for six months (Kinoti, 2009).

Most of the schools in the feeding program are situated in the slum areas and settlements where poverty and unemployment of parents is rampant. Selection of these schools is done by a representative of the United Nations WFP. Civic leaders are chosen as co-opted members of school management committees in their wards. Each school management committee is expected to put the following items in order before initiation of the program:- a secure a kitchen, running water, water tanks or boreholes, stoves, fuel, adequate cooking pots, spacious storage facilities, well-functioning toilets or pit latrines and cooks who were medically fit (Kinoti, 2009).

WFP distributes the following food items to schools under the Expanded and Regular School Meals Programmes: white maize, yellow split peas, vegetable oil, salt, bulgur wheat, green peas, and rice. Corn Soya Blend (CSB) is given only to schools under the Regular School Meals Programme. Food distribution to schools is done through Feed the Children (FTC) who is WFP implementing partner. Food dispatches are done from the WFP Kipevu Warehouse. Food allocation is based on the enrolment of pupils in school that particular term. Food storage is done at the individual schools.

2.3 Assessment of nutritional status

Growth assessment serves as a means for evaluating the health and nutritional status of children and also provides an indirect measurement of the quality of life for an entire population. It is the single measurement that best defines the health and nutritional status of children, because disturbances in health and nutrition, regardless of their aetiology, invariably affect child growth (De Onis et al, 1993). Moreover, growth assessment is universally applicable: it does not pose any cultural problems; measuring equipment is easy to transport; the tools are simple and robust, can be set up in any environment; users require little training; and the procedure is inexpensive and non-invasive (WHO, 1995).

Anthropometry provides one of the most important indicators of children's nutritional status. Three indices (stunting, wasting and underweight) are expressed as standardised scores (Z scores) or standard deviation units from the median for the child growth standards recommended by the WHO. Children who fall more than two standard deviations below the reference median are regarded as undernourished while those who fall more than three standard deviations below the reference median are considered severely undernourished (KNBS, 2010).

Children whose height is below minus two standard deviations from the median of the reference population are considered stunted or short for their age. Stunting is the outcome of failure to receive adequate nutrition over an extended period and is also affected by recurrent or chronic illness. Children whose weight for height is below minus two standard deviations from the median of the reference population are considered wasted (or thin). Wasting represents failure to receive adequate nutrition in the period immediately before the survey and typically is the result of recent illness episodes especially diarrhoea or of a rapid deterioration in food supplies. Children whose weight for age is below minus two standard deviations from the median of the reference population are considered underweight. The measure reflects the effects of both acute and chronic malnutrition (KNBS, 2010).

According to the KDHS findings, 35 percent of Kenyan children are stunted while 14 percent are severely stunted. Stunting levels increase rapidly with age peaking at 46 percent among children in the second year of life and remaining at 32-35 percent in older children. Stunting levels are higher for boys than girls and for rural children than for urban children. Sixteen percent of Kenyan children are underweight with 4 percent classified as severely underweight (KNBS and ICF Macro, 2010).

2.4 Micronutrient deficiencies

Micronutrient deficiencies affect nearly two billion people worldwide (WFP, 2010). Deficiencies of iron, vitamin A, iodine, and zinc among children are the most devastating in terms of impaired development and mortality.

2.4.1 Iodine deficiency and iodine deficiency disorders

Iodine deficiency affects an estimated 1.6 billion people worldwide and an estimated 60 million school children in the developing world. It is the leading cause of preventable intellectual impairment worldwide and is also associated with lower test scores and cognitive abilities. Between 35 and 70 percent of school children in developing countries may be iodine deficient (Bundy et al, 2006). The consequences of iodine deficiency include severe mental retardation, goitre, hypothyroidism, abortion, stillbirths and low birth weight. School children are often the target population of IDD assessments because of their physiological vulnerability and their accessibility. Universal iodisation of salt is seen as the permanent and sustainable solution to the global IDD problem.

2.4.2 Vitamin A deficiency (VAD)

Vitamin A deficiency is a major public health problem, affecting an estimated 85 million school children (Bundy et al, 2006). This deficiency impairs immune function and increases the risk of dying from diarrhoea, malaria, and measles. It is also the leading cause of child blindness in developing countries and contributes to growth failure and weakened immunity in young children which results in 800,000 child deaths per year (WFP, 2010). Mild or subclinical Vitamin A deficiency causes impaired immune function, increased severity of some infections and an increased risk or mortality from infectious diseases and is widely recognized as an important cause of blindness.

2.4.3 Iron

Iron requirements increase during adolescence, since girls begin to menstruate at this time. In addition, the increase in muscle mass and other soft tissue, both in males and females, increases the need for iron (Growth, 1973). Because it is poorly absorbed, dietary iron barely meets the daily requirement for most people. Modest losses, increased requirements, or decreased intake readily produces iron deficiency (Lichtin, 2008).

Iron deficiency is the most common form of micronutrient deficiency in school children (Hall et al 2001). More than half the school children in low-income countries are estimated to suffer from iron deficiency anaemia (Bundy et al, 2006). Iron deficiency symptoms are usually nonspecific. Most of them are due to anaemia. They include fatigue, loss of stamina, shortness of breath, weakness, dizziness, and pallor. In severe iron deficiency, some uncommon symptoms include pica (an abnormal craving to eat substances e.g., ice, dirt, paint), glossitis, cheilosis, concave nails (koilonychias), and, rarely, dysphagia (Lichtin, 2008).

2.4.4 Zinc

Zinc deficiency contributes to growth failure and weakened immunity in young children and results in 800,000 child deaths per year (WFP, 2010). The deficiency is assumed to be widespread in areas where diets lack diversity and non-dairy animal source foods (Kennedy et al, 2003). Qin et al, (2009) suggests that dietary patterns and interaction of micronutrients play important roles in zinc deficiency and that the deficiency is more prevalent in boys than girls.

Poor appetite (Umeta et al. 2002) and impaired taste awareness (Cavan et al. 1993) have been associated with mild zinc deficiency in children. If present together they could lead to a simultaneous decrease in food intake, and thus deficits in energy and associated nutrients. Impaired linear growth is a prominent feature of zinc deficiency among children in both developed and developing countries (Hambidge, 2000; Brown et al. 2002). According to the US Institute of Medicine (2001), the health of children is especially sensitive to zinc deficiency, since they have relatively higher requirements.

2.5 Critique of methodology

2.5.1 The Dietary diversity tool

The tool was chosen by FAO because it is less subject to recall error, less cumbersome for the respondent, conforms to recall time period in many other dietary diversity studies. It is useful for capturing important events e.g., seasonality. It also indicates the household's primary source of food and is a key element of a high quality diet. At individual level dietary diversity questionnaire is appropriate for individuals above 3 years.

One 24hr recall period does not provide an indication of individual's habitual diet. It also does not include the foods eaten outside the home. There is no universal cut-off point for defining low quality diet. The questionnaire is standardized and was developed with the intention of universal applicability. It is therefore not culture, population or location specific. Therefore it is necessary to customize it to the local context prior to use. Standardization of the instrument is crucial for comparability of results (Gibson, 2005).

2.5.2 Food frequency questionnaire (FFQ)

This tool aims to assess the frequency with which food items or food groups are consumed during a specified time period. It was originally designed to provide descriptive qualitative information about usual food consumption patterns. It imposes fewer burdens on respondents than most other dietary assessment methods. The results are easy to collect and process and they are generally taken to represent usual intakes over an extended period of time. However, the validity and feasibility for estimating food intakes has not been clearly established (Gibson, 2005).

2.5.3 The 24 hour recall questionnaire

The 24hour recall method is suitable for assessing the average usual intakes of a large population, provided that the sample is truly representative and that the days of the week are adequately represented. It is a quick to administer method and is done once. It is sometimes prone to memory errors as it is hard to remember what someone ate. Longer reference periods result in less accurate information due to imperfect recall. Study subjects with irregular eating habits may have difficulty describing usual frequency of food consumption. A single 24Hr recall cannot classify a subject into usual levels of intakes because intakes may differ on different days. This method is tedious both for the interviewer and respondent. If the respondent is illiterate, it is difficult to estimate the portion sizes consumed (Gibson, 2005).

2.6 Gaps in knowledge

Since the WFP sponsored SMP was initiated in Mombasa, no comprehensive assessment has been carried out to establish the contribution of the school meal to the children's diet. It was essential to determine this. Even though the daily meal mixed with oil and salt is estimated to provide the children with averages of 703.25kcal, 13.5g protein and 5g fat (Lambers, 2009b), there was a necessity to substantiate to what extent this was factual within the study area. It was also vital to find out how significantly the school meal contributed to the energy, protein, iron, iodine, zinc and vitamin A intake of the children's diet and to the children's overall RDA.

CHAPTER 3

HOUSEHOLD SOCIO-DEMOGRAPHIC CHARACTERISTICS OF CHILDREN IN A SCHOOL WITH A FEEDING PROGRAM AND WITHOUT

Abstract:

Objective: To determine and compare the socio-economic and demographic characteristics in the households of children in a school with a feeding program and one without.

Design: A cross sectional study design was employed. The study was conducted between August and October 2010 in Kisauni District, Mombasa County, Kenya. A total of 191 school children were selected from two schools; one with a school meal program while the other lacked. Information on demography and socioeconomic conditions was obtained using a semi structured questionnaire. Background information sought from participating households included age, sex, religion, marital status, education and occupation. Socio-economic characteristics investigated were; income, household size, type of sanitary facility, and possession of specific household items.

Results: The mean age of the SMP children was 13.13 years (SD±2.7) while the mean age of the Non SMP children was 12.04 years (SD±2.4). T test results indicated differences in the age of the child, main source of income, sanitation facility and family income between the two schools studied. Of these, the most significant differences were in the family income and age of child. In SMP school area, the mean number of people per household was 7(SD±2.8) while in the Non SMP school area, the mean number was 6 (SD±2.4). There was a significant difference between the two schools in absence from school with the SMP children missing school more. The major reason for this was feeding fees.

Conclusion: The socio-demographic characteristics of households in both areas studied were comparable but the SMP school area had households with better incomes and sanitation facilities. The WFP objective of keeping children in school through school meals is being undermined by

feeding fees. Consequently, the school committee in charge of the feeding program ought to consider reducing or scraping of the fees especially for children whose parents/caretakers cannot afford to pay. If not so, there should be a provision where such children are catered for and do not have to pay.

Introduction

A large body of epidemiologic data shows that diet quality follows a socioeconomic gradient. Whereas higher-quality diets are associated with better education and greater affluence, energy-dense diets that are nutrient-poor are preferentially consumed by persons of lower socioeconomic status (SES) and of more limited economic means (Darmon and Drewnowski, 2008). The more affluent population subgroups are not only healthier and thinner, but they also consume higher-quality diets than the poor (Drewnowski and Darmon 2005).

Socio-economic status is not a straightforwardly measurable human trait, but rather a multi-factorial condition which is embedded in environmental, material and personal characteristics. These mutually interact in a complex way and often reinforce each other through self-perpetuating trickledown spirals, not only on individual level and social layer level, but also on intergenerational level (De Henauw et al, 2003).

Although micronutrient intake and, hence, diet quality are affected by SES, little evidence indicates that SES affects either total energy intake or the macronutrient composition of the diet. Given that SES variables are likely to affect all aspects of energy balance, from access to healthy foods to opportunities for physical activity, there is a pressing need to address them directly (Darmon and Drewnowski, 2008).

Diet quality is affected not only by age and sex, but also by occupation, education, and income levels (Galobardes et al, 2001, Groth et al, 2001 and Turrell et al, 2003), the conventional indexes of socioeconomic status (SES) or social class (Krieger et al, 1997).

The objective of this study was to determine and compare the socio-economic and demographic characteristics in the households of school children in selected schools.

Research methods

Study area

Kisauni District is situated in the Mombasa County of the Coastal region of Kenya. The District is on the north of Mombasa Island. It is at an average altitude of 1 meter. It covers an area of 109.7km $^{2.}$ It has 3 divisions. The main agricultural activities include fishing in the ocean, small scale/subsistence farming, palm tree cultivation, dairy keeping and a lot of poultry farming. School feeding is widespread in all areas of the District, income levels are low and food shortages are frequent within the area.

Study population

The study sample comprised of children aged 6 to 18 years, attending a public school within Kisauni. In Kisauni District the schools are subdivided into two main areas: Kengeleni and Bamburi. The total number of public schools in the District is 24. Most of the schools in the feeding program are situated in the slum areas and settlements where poverty and unemployment of parents is rampant. Selection of these schools is done by a representative of the United Nations (UN) WFP which also funds the feeding program.

Study design:

This was a cross-sectional study that was conducted between August and October 2010. It incorporated both qualitative and quantitative research approaches.

Sample size and sampling procedures

A sample size of 191 children was used (110 participating in a feeding program and 81 non-participants). The non-participants were less as some households that had been selected declined to respond and by that time the children were engaged in end term exams and could not be accessed. The sample size was determined using the Fisher formula (Fisher et al., 1991). The sampling at the District level was done purposively. Public schools in the District were divided into two categories; schools with a feeding program and those without. Two schools were then randomly sampled from the two categories. In both schools, the school registers of all children in class two to seven with information on age and sex were obtained. Finally, one hundred and ninety one children were selected from the schools using proportionate sampling in each class.

Data collection procedures and instruments

Permission to carry out the study was obtained from the National Council of Science and Technology – Ministry of Higher Education Science and Technology. Permission was also sought from the Municipal Education Office-Mombasa Municipality. Parents were requested for an informed consent after the purpose and objectives of the study were clarified to them, and all information collected on each individual was held in confidence.

Interviews were carried out in Swahili by four trained enumerators with basic college education. They were intensively trained for two days on how to interact with respondents, collect accurate data and the correct techniques of measurement and interviewing. The training included practical sessions and was based on a module previously prepared by the researcher. A semi structured questionnaire was used to conduct interviews with the children's parents to obtain information on household socioeconomic and demographic characteristics of the children. Background information sought from the household occupants included age, sex, marital status, education level and occupation.

Data analysis

Answers obtained from the questionnaire were coded and entered into a data entry template which had been developed in advance in SPSS 16.0 for windows (SPSS Inc., Chicago IL, US). Data entered into the computer was cleaned before it could be analyzed. Participant's demographic and socioeconomic data were analyzed using descriptive statistics, t tests and associations evaluated using the Chi-square test.

Results

Demographic and socio-economic characteristics

Age and sex

The mean age of the SMP children was 13.13 years (SD±2.7) while the mean age of the Non SMP children was 12.04 years (SD±2.4). In the SMP school, the male to female ratio was 0.692. In the other school it was 1.079.

Table 1: Demographic characteristics of children

	Feeding program (n=110)		No feeding program (n=81)	
	Male	**Female**	**Male**	**Female**
	n(%)	**n(%)**	**n(%)**	**n(%)**
Characteristics of children				
Sex of child	45 (40.9)	65 (59.1)	42 (51.9)	39 (48.1)
Age of child in years				
Minimum age	6.83	8.17	8.17	7.33
Maximum age	18.42	18	17.08	18.58

Household size

In SMP school area, the size of households ranged from 2 to 17. The mean number of people per household was 7(SD±2.8). The dependency ratio was 0.83. In the Non SMP school area, the size of households ranged from 2 to 15. The mean number of people per household was 6 (SD±2.4). The dependency ratio was 0.94.

Distribution of household occupants by age and sex

Households assessed in the SMP school had a total population of 731 while in the second school, the total population was 482 people. The age pattern for both study areas was similar. Mean age in the households surveyed was 20 years (SD±14.3 in the SMP school) and (SD±15.1 in the Non SMP school). Individuals below the age of 20 years comprised majority of the households.

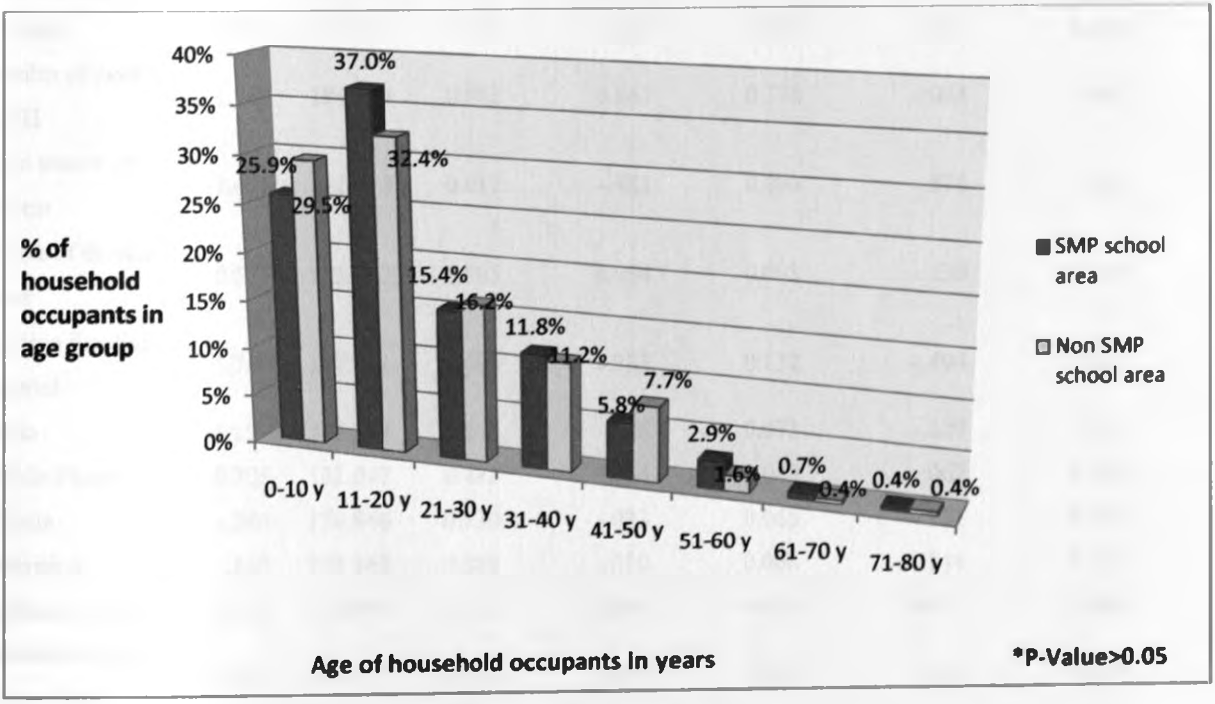


Figure 1: Distribution of household occupants by age

Socio-demographic characteristics of the children's households

The socioeconomic characteristics investigated in the households have been presented below. The t test results indicate that between the two schools studied, differences were found in the age of the child, main source of income, sanitation facility and family income. Of these, the most significant differences were in the family income and age of child.

Table 2: Comparing socioeconomic characteristics of households using t test

Variable	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Sex of child	1.498	170.798	0.136	0.109	0.073	-.035	0.254
Age of child	2.923	182.371	0.004	1.08445	.37098	0.352	1.81641
Marital status of Child's parents	0.192	176.620	0.848	0.036	0.190	-.338	0.411
Sex of Household Head	-.933	166.787	0.352	-.064	0.068	-.199	0.071
Person's Age	0.084	990.783	0.933	0.073	0.866	-1.626	1.772
Religion	-1.069	911.832	0.285	-.036	0.034	-.103	0.030
Number of people in HH	1.749	184.384	0.082	0.661	0.378	-.084	1.407
Main source of income	-2.406	162.613	0.017	-.481	0.200	-.876	-.086
Source of drinking water	0.577	185.857	0.565	0.054	0.093	-.130	0.238
Housing Roofing material	-1.760	187.601	0.080	-.233	0.132	-.494	0.028
Radio	-1.159	170.738	0.248	-.085	0.073	-.229	0.060
Mobile Phone	0.705	182.047	0.482	0.034	0.049	-.062	0.130
Bicycle	-.346	174.846	0.730	-.023	0.065	-.151	0.106
Television	-.140	173.168	0.889	-.010	0.068	-.144	0.125
Sanitation Facility	2.358	178.648	0.019	0.090	0.038	0.015	0.166
Household own a piece of land	-1.220	175.734	0.224	-.087	0.072	-.229	0.054
Family Income	3.251	187.309	0.001	0.298	0.092	0.117	0.479

Characteristics of the Household head

In the SMP school, the household heads ages ranged from 19 to 75years while in the non SMP school, the household heads ages ranged from 25 to 91years. Other characteristics of the Household head are summarized in table 3.

Table 3: Characteristics of the household head

	Feeding program (n=110)		No feeding program (n=81)	
Characteristics of the Household head	**Male Headed HH**	**Female Headed HH**	**Male Headed HH**	**Female Headed HH**
	n(%)	**n(%)**	**n(%)**	**n(%)**
Sex	79(71.8)	31 (28.2)	53(65.4)	28 (34.6)
Education Level				
Completed primary	26 (23.6)	8 (7.3)	19 (23.5)	5 (6.2)
Dropped from primary	18 (16.4)	9(8.2)	10 (12.3)	6 (7.4)
Completed secondary	17 (15.5)	3 (2.7)	10 (12.3)	4 (4.9)
College/University	8 (7.3)	4(3.6)	3 (3.7)	0
Illiterate	4(3.6)	6 (5.5)	6 (7.4)	9 (11)
Occupation				
Salaried employee	24 (21.8)	5 (4.5)	19 (23.5)	5 (6.2)
Self-employed	20(18.2)	16 (14.5)	13(16)	15 (18.5)
Casual labourer	31 (28.2)	4(3.6)	17 (21)	4 (4.9)
Unemployed	3 (2.7)	4(3.6)	3 (3.7)	1 (1.2)
Marital status				
Married	76 (69)	10 (9.1)	48(59.3)	2 (2.5)
Separated	1(0.9)	9(8.2)	1 (1.2)	8 (9.9)
Widowed	2(1.8)	9(8.2)	3(3.7)	11(13.6)

Absence from school

As part of socioeconomic characteristics, absence from school was investigated. Table 4 gives a t test comparison of children who missed school and outlines the specific reasons they were away from school. There is a significant difference between the two schools with the SMP school having more children missing school. The major reason for this was feeding fees.

Table 4: Comparing absence from school using t test

Variable	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Child sent away from school	-5.290	167.771	0.000	-.363	0.069	-.499	-.228
School fees	-.945	175.951	0.346	-.067	0.071	-.206	0.073
Text books	-2.028	109.000	0.045	-.036	0.018	-.072	0.000
School Uniform	-.750	187.877	0.454	-.015	0.020	-.054	0.024
Feeding fees	-9.018	109.000	0.000	-.427	0.047	-.521	-.333

Characteristics of the household occupants

The study respondents were both male and female and included the child's parents' and other guardians living with them. The mean age of respondents was 35.14years (SD±11.8) in the SMP school while in the other school, it was 34.17 (SD±8.9). Further details are displayed in table 5.

Table 5: Socio-demographic characteristics of household occupants

	Feeding program (n=731)		No feeding program (n=482)	
Variable	Males	Females	Males	Females
	n(%)	n(%)	n(%)	n(%)
Sex	18 (2.5)	92(12.6)	13(2.7)	68(9.3)
Relationship to child				
Mother		58(7.9)		48(6.6)
Aunt		16(2.2)		
Sister		13(1.8)		8(1.7)
Father			9(1.9)	
Level of schooling				
Completed primary	4(0.6)	19(2.6)	6(1.2)	28(5.8)
Dropped from primary	3(0.4)	21(2.9)	4(0.8)	27 (5.6)
Illiterate	2(0.3)	12 (1.6)	0	17(3.5)
Completed secondary	1(0.1)	7(0.96)	2(0.4)	10(2.1)
Type of Occupation				
Self-employed	62(8.5)	28(3.8)	48(10)	18(3.7)
Casual labourers	55(7.5)	11(1.5)	37(7.7)	8(1.7)
Salaried employees	37(5.1)	11(1.5)	20(4.2)	10(2.1)

Discussion

The information presented here is intended to assist in the assessment of the representativeness of the survey sample and facilitate interpretation of key indices presented in subsequent chapters.

Demographic and socio-economic characteristics

Household size

The Non SMP area had a slightly lower number of people per household (6) compared to the SMP area (7). These results were higher than the national averages indicated by the 2008 KDHS which suggest that the mean size of a Kenyan household is 4.2 persons. This was slightly less than the mean household size of 4.4 found in the 2003 KDHS and mean household size of 3.1 in the urban areas as reported by KNBS and ICF Macro, 2010. The difference may have been because the households surveyed had many relatives and extended family living with them.

Distribution of household occupants by age and sex

Data in the current study indicates there are more persons under 30 years with those below 20 years accounting for more than half of the population. This data is consistent with the 2008 KDHS. In the KDHS report, for both sexes, there are more persons in the younger age groups than in the older age groups. Those aged 0-18 years account for more than half of the population (KNBS and ICF Macro, 2010). Those aged 60 years and above make up 2.31% of the total population surveyed. The age dependency ratio is 0.88. According to the KDHS 2008, those age 65 years and older make up about 4% of the total Kenyan household population. The age dependency ratio in Kenya increased slightly, from 0.92 in 2003 to 0.96 in 2008 (KNBS and ICF Macro, 2010).

The results of the current study indicate a lower dependency ratio and percentage for persons above 60 years. The lower percentage could have been due to the study setting being peri-urban which meant most of the residents were young and middle aged people able to earn an income to sustain themselves. Many of the people above 60 years had retired and moved to the rural areas.

Socio-demographic characteristics of the children's households

Among the socioeconomic characteristics investigated in the households, the SMP area differed from the Non SMP area in that it had households with the highest incomes. This may have been because more people here were permanently employed with a higher chance of better incomes. More people from the SMP area were also better educated compared to the Non SMP area granting them opportunities for better employment. More households in the SMP area also had flush toilets with the Non SMP area having more pit latrines. This implies more accessibility to water for the SMP area and therefore improved sanitation.

The availability of durable consumer goods is a useful indicator of a household's socioeconomic status. Ownership of durable goods varies according to residence and the nature of the asset. In the current study, there were no significant differences in the household possessions of the two study areas. However, it is possible that some of the respondents may have been providing misleading information concerning their household possessions especially those that could not be seen by the interviewer.

School attendance:

One of the aims of school feeding is to increase school attendance and enrolment (Allen, 2001; Levinger, 1986). It is also one of the most commonly cited benefits of school feeding. According to the World Food Program, research and experience has shown that when food is provided at school, hunger is immediately alleviated, and school attendance often doubles within one year (WFP, 2005). There is also evidence that school feeding programs increase school attendance, cognition, and educational achievement, particularly if supported by complementary actions such as deworming and micronutrient fortification or supplementation (Bundy et al, 2009).

Winch and Leland (2009) found that rates of enrolment and attendance in Mali grew more significantly in schools with canteens than those without, while school feeding programs in India had considerable success in increasing school attendance. The Kristjansson et al review (2007), findings showed that school meals could improve school attendance in lower income countries. However, effects were found to be small. This difference might be due to the fact that families in lower-income countries were more motivated by the prospects of receiving food. Levinger, 1986 concluded that school feeding could have positive effects on enrolment and attendance, particularly when designed to target vulnerable children.

Contrary to the research findings above, most of the children who were absent from school in the current study were from the SMP school. The major reason they missed school was because of feeding fees (42.7%). This study found that many of the children's parents could not afford to pay the feeding fees and hence the children were sent away from school sometimes for up to two weeks. Each school is responsible for setting up the amount to be paid as feeding fees and many of the parents and students interviewed felt that the amount of seventy Shillings paid at this SMP school was high for them. The children's absence from school makes it difficult to access the benefits of the school meal and consequently the nutrient contribution the lunch is supposed to make in their diet.

Conclusion

The socio-demographic characteristics of households in both areas studied were comparable. However, the SMP school had households with better incomes and sanitation facilities.

The WFP objective of keeping children in school through school meals is being undermined by the feeding fees the children have to pay which end up keeping them children away from school.

Recommendation

The school committee in charge of the feeding program ought to consider reducing or scraping of the fees on feeding especially for children whose parents/caretakers cannot afford to pay. If not so, there should be a provision where such children are catered for and do not have to pay.

References:

Allen, L. H and Gillespie, S. R. (2001). **What works? A Review of the Efficacy and Effectiveness of Nutrition Interventions.** Manila, Philippines.

Bundy, D., Burbano. C., Grosh. M., Gelli. A., Jukes, M and Drake, L. (2009). **Rethinking School Feeding: Social Safety Nets, Child Development and the Education Sector.** Washington D.C.

Darmon, N and Drewnowski A. (2008). **Socioeconomic disparities in diet quality.** Am J Clin Nutr. No. 87. Pp: 1107–1117.

De Henauw, S., Matthys, C and De Backer, G. (2003). **Socioeconomic Status, nutrition and health Arch.** Public Health. No. 61. Pp: 15-31

Drewnowski, A and Darmon, N. (2005). **The economics of obesity: dietary energy density and energy cost.** Am J Clin Nutr. No. 82 (suppl). Pp: 265S–273S.

Fisher, A. A., Laing, J. E., Stoeckel, J. E and Townsend, J. W. (1991). **Handbook for Family Planning Operations Research Design.** 2nd Ed. Operations research, Population Council. New York, U.S.A. Pp: 43-46.

Galobardes, B., Morabia, A and Bernstein, M. S. (2001). **Diet and socioeconomic position: does the use of different indicators matter?** Int J Epidemiol. No. 30. Pp: 334–340.

Groth, M. V., Fagt, S and Brondsted, L. (2001) **Social determinants of dietary habits in Denmark.** Eur J Clin Nutr. No. 55. Pp: 959–966.

Kenya National Bureau of Statistics (KNBS) and ICF Macro. (2010). **Kenya Demographic and Health Survey 2008-09.** Calverton, Maryland: KNBS and ICF Macro.

Krieger, N., Williams, D. R and Moss, N. E. (1997). **Measuring social class in US public health research: concepts, methodologies, and guidelines.** Annu Rev Public Health No. 18. Pp: 341–378.

Kristjansson, B., Petticrew, M., MacDonald, B., Krasevec, J., Janzen, L., Greenhalgh, T., Wells, G. A., MacGowan, J., Farmer, A. P., Shea, B., Mayhew, A., Tugwell, P and Welch, V. (2007). **School feeding for improving the physical and psychosocial health of disadvantaged pupils.** Cochrane Database of Systematic Reviews. Pp 2 – 29.

Levinger, B. (1986). **School Feeding Programs in Developing Countries: An Analysis of Actual and Potential Impact,"** Aid Evaluation Special Study No 30.

Turrell, G., Hewitt, B., Patterson, C and Oldenburg, B. (2003). **Measuring socioeconomic position in dietary research: is choice of socio-economic indicator important?** Public Health Nutr. No. 6. Pp: 191–201.

WFP (World Food Programme). (2005). World Food Bulletin. **WFO head calls on leaders to support universal school feeding for world's poor children.** Accessed on 10th January 2011 at http://www.wfp.org/english/?ModuleID=137&Key=464

Winch, R. and Leland, M. (2009). **International Approaches to School Feeding: Country Experiences from Mali, Chile, and India.** Global Child Nutrition Foundation accessed on 17th May 2010 at www.hungercenter.org/international/International_Approaches_to_School_Feeding. Pp 5 – 28.

CHAPTER 4

FACTORS ASSOCIATED WITH POOR NUTRITIONAL STATUS AND MORBIDITY PATTERNS AMONG SCHOOL-GOING CHILDREN IN KISAUNI DISTRICT

Abstract:

Objective: To assess the factors associated with children's poor nutritional status and the association to illness in a school providing lunch compared with one that does not.

Design: A cross sectional study design was employed. The study was conducted between August and October 2010 in Kisauni District, Mombasa County, Kenya. A total of 191 school children were selected from two schools; one with and one without a school meal program. Anthropometric measurements (height and weight) of the children were taken following standardized techniques recommended by WHO. From these measurements, two indices were calculated: Body mass index (BMI for age) and Weight for Age (WAZ). The children's morbidity events were obtained using a semi structured questionnaire.

Results: Using BMI for age, there was no significant difference in the nutritional status of children in both schools. In the two weeks preceding the study, the prevalence of reported Malaria was significantly different between the two schools. It was more common in the SMP school compared to the Non SMP school. No relationship was found between nutrition status and reported morbidity among children in either school. Among the factors found to contribute to or be protective of a low BMI, none of them factors was found to be significant.

Conclusion: There was no association between the socioeconomic status, reported morbidity and nutrition status of the children in a school meal program compared to those not in one. There were also no significant differences in the nutritional status of children from both schools investigated. It is recommended that WFP and stakeholders consider the nutrition component while designing their meal programs in order to significantly improve the nutritional status of the target children.

Introduction

Good health and adequate nutrition promote both physical growth and learning, while good health and nutrition education at school age can lay the foundation for lifelong good health (ACC/SCN, 1998). Poor health and nutrition compromise both the quality of life of school children and the potential to benefit fully from the education they receive. Meeting the nutrition needs of children is critical to supporting their healthy growth and development (Cataldo et al, 2003).

School children are particularly vulnerable to under-nutrition. The priority in nutrition interventions is often to prevent malnutrition during foetal development and the first years of life (Bundy et al, 2009). Under-nutrition is commonly reflected in a high prevalence of wasting, stunting, and micronutrient deficiency (Bundy et al, 2006). Stunting, or low height for age, is a physical indicator of chronic or long-term malnutrition, whereas wasting and underweight (low weight for age) are indicators of both chronic and acute malnutrition (Bundy et al, 2006). Both are widespread in school children in developing countries (West et al, 2006).

School feeding offers an excellent opportunity in school children, as a means for enhancing nutrition and improving school attendance. Though the programs cannot reverse the consequences of earlier malnutrition, providing meals at school can have a significant impact on nutritional status (Bundy et al, 2009, Bundy et al, 2006 and Kristjansson et al, 2007).

Growth assessment serves as a means for evaluating the health and nutritional status of children. It is the single measurement that best defines the health and nutritional status of children (De Onis et al, 1993). Anthropometry is a sensitive indicator of health, growth and development in children. It is a quantitative method that is highly sensitive to nutritional status; especially among children. It is the single most universally applicable, inexpensive, and non invasive method available to assess the size, proportion and composition of human body (WHO, 1995).

WHO recommends three indices for evaluating the nutritional status of school children based on anthropometry. These indices; stunting, wasting and underweight are expressed as standardised scores (Z scores) or standard deviation units from the median for the child growth standards. Children who fall more than two standard deviations below the reference median are regarded as undernourished while those who fall more than three standard deviations below the reference median are considered severely undernourished (KNBS and ICF Macro, 2010). The Body Mass Index (BMI for age), is the most appropriate variable for nutritional status among adolescents (WHO, 1995).

The objective of this study was to assess the nutritional status of children and its association to illness in a school providing lunch compared with one that does not.

Research methods

Study area

Kisauni District is situated in the Mombasa County of the Coastal region of Kenya. The District is on the north of Mombasa Island. It is at an average altitude of 1 meter. It covers an area of 109.7km ^{2}. It has 3 divisions. The main agricultural activities include fishing in the ocean, small scale/subsistence farming, palm tree cultivation, dairy keeping and a lot of poultry farming. School feeding is widespread in all areas of the District, income levels are low and food shortages are frequent within the area.

Study population

The study sample comprised of children aged 6 to 18 years, attending a public school within Kisauni. In Kisauni District the schools are subdivided into two main areas: Kengeleni and Bamburi. The total number of public schools in the District is 24. Most of the schools in the feeding program are situated in the slum areas and settlements where poverty and unemployment of parents is rampant. Selection of these schools is done by a representative of the United Nations (UN) WFP which also funds the feeding program.

Study design:

This was a cross-sectional study that was conducted between August and October 2010. It incorporated both qualitative and quantitative research approaches.

Sample size and sampling procedures

A sample size of 191 children was used (110 participating in a feeding program and 81 non-participants). The non-participants were less as some households that had been selected declined to respond and by that time the children were engaged in end term exams and could not be accessed. The sample size was determined using the Fisher formula (Fisher et al., 1991). The sampling at the District level was done purposively. Public schools in the District were divided into two categories; schools with a feeding program and those without. Two schools were then randomly sampled from the two categories. In both schools, the school registers of all children in class two to seven with information on age and sex were obtained. Finally, one hundred and ninety one children were selected from the schools using proportionate sampling in each class.

Data collection procedures and instruments

Permission to carry out the study was obtained from the National Council of Science and Technology – Ministry of Higher Education Science and Technology. Permission was also sought from the Municipal Education Office-Mombasa Municipality. Parents were requested for an informed consent after the purpose and objectives of the study were clarified to them, and all information collected on each individual was held in confidence.

Two basic variables (body height and weight) and a single derived variable (BMI for age) were utilized. All the Anthropometric measurements were taken following standardized techniques recommended by WHO using guidelines from the Food and Nutrition Technical Assistance (FANTA) Project (Cogil, 2003). All measurements were made twice and an average value recorded. The children were weighed to the nearest 100 g on scales with a weighing capacity of 10 to 140 kg (Ashton Meyers). The children wore minimum clothing and had no shoes, jackets, heavy jewellery, keys and wallets on them. The scale was placed on a flat even surface and read at eye level after which the measurement was recorded.

Their height was measured to the nearest 1 mm when the participants were standing upright with their shoes removed. The pupils were positioned with their feet together and flat on the base plate with their head and back straight against the vertical measuring rods. Once the correct position was achieved, the interviewer lowered the head plate until it just touched the top of the pupil's head, and while maintaining this position, he or she was asked to stand as tall as possible, without lifting the heels. Age was verified using the children's clinic attendance cards, baptism cards or class registers.

Body mass index (BMI for age), Weight for Age (WAZ) and Height for Age (HAZ) were the indices used to express nutritional status in this study. The reference standards used for comparing the height, weight and BMI indices, were the WHO Reference 2007. These are specific for 5-18 years to monitor the growth of school children and adolescents (De Onis et al, 2007).

Data analysis

Anthropometric data collected in the field was entered into WHO AnthroPlus V 3.1.0 software. This software enables monitoring growth in individuals and populations of children from birth to 18 years of age. The software used default lower and upper SD boundaries as flag limits to identify any extreme or potentially incorrect z-score values. When that happened, the data was checked for entry errors. Where the flag could not be corrected, all flagged z-scores were excluded in the analysis.

Wasting (weight-for-age) was not calculated for children above 10 years. This was because the indicator does not distinguish between height and body mass in an age period where many children are experiencing the pubertal growth spurt and may appear as having excess weight (by weight-for-age) when in fact they are just tall (WHO, 2009). The analysis obtained from the WHO AnthroPlus software was then exported to Excel and to SPSS16.0 for windows (SPSS Inc., Chicago IL, US) for further analysis.

Results

Nutritional Status

An independent t test was conducted to compare the means in nutritional status among the two schools. There were no significant differences between children in the two schools. The results are presented in table 6

Table 6: Comparing nutrition status means using t test

Variable	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
BMI for Age	0.243	173.89	0.808	0.023	0.095	-.16462	0.21086

Morbidity events

In the two weeks preceding the study, 35% of children from the SMP school had become sick while in the Non SMP school, it was 28%. Between the schools, the prevalence of reported Malaria was significantly different. Malaria was more common in the SMP school compared to the Non SMP school.

Table 7: Comparing reported morbidity in the past two weeks

Variable	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Illness in the past two weeks	-1.036	177.742	0.301	-.071	0.068	-.205	0.064
Diarhoea	-.468	186.227	0.640	-.012	0.025	-.061	0.038
Serious ARI	-1.710	188.132	0.089	-.089	0.052	-.191	0.014
Malaria	-2.244	171.844	0.026	-.075	0.034	-.142	-.009
Wounds	-.750	187.877	0.454	-.015	0.020	-.054	0.024
Ear problems	-1.000	109.000	0.320	-.009	0.009	-.027	0.009
Stomach ache	0.302	156.689	0.763	0.007	0.022	-.036	0.049
Severe headache	1.853	98.366	0.067	0.053	0.028	-.004	0.109

Association between nutrition status and reported morbidity

Table 8 demonstrates the association between nutrition status and illness in the children investigated. It also compares differences in the two schools within those categories. There was no relationship between nutrition status and reported morbidity among children in either school.

Table 8: Nutrition status by school and reported morbidity

Variable	Feeding program (n=110)	No feeding program (n=81)		
	Ill in the past two weeks	Ill in the past two weeks	P Value	X^2 Value
Nutritional status	n(%)	n(%)		
Wasting (WFA)			0.534	1.26
Moderate (< -2 to ≥-3 Z-scores)	0	1(1.2)		
Underweight (BFA)			0.752	1.20
Moderate (< -2 to ≥-3 Z-scores)	2(1.8)	3(3.7)		

Factors associated with underweight

Univariate analysis was carried out to determine the factors contributing to having a low BMI (being underweight) in the children of this study. See table 9.

Table 9: Factors associated to being underweight

Variable	Underweight	Not Underweight	OR	95% Confid. Interval		P value
	n(%)	n(%)		Lower	Upper	
	15 (7.8%)	176 (92.1%)				
Age categories						
< 9 years	3(20)	24(13.6)	1			
10 – 12.99 yrs	6 (40)	66(37.5)	0.73	0.17	3.14	0.67
13 – 14.99 yrs	4 (26.7)	45(25.6)	0.71	0.15	3.4	0.67
> 15 years	2 (13)	41(23)	0.39	0.06	2.5	0.3
Sex						
Male	9(60)	75(43)	1			
Female	6 (40)	101(57)	0.5	0.17	1.45	0.2
Sex of HHH						
Male headed households	7(46.7)	124(70.5)	1			
Female headed households	8 (53)	52(29.5)	2.7	0.94	7.9	0.07
Deworming						
Not done	10(66.7)	99(56.3)	1			
Done	5 (33.3)	77(43.8)	0.6	0.2	1.96	0.4
Level of income						
< 5000	9(60)	111(63.1)	1			
5000 – 15000 Ksh	6 (40)	53(30.1)	1.4	0.5	4	0.55
15000-25000	0	8(4.6)				
>25000	0	4(2.3)				
Illness in the past 2 weeks						
No	10(66.7)	119(67.6)	1			
Yes	5 (33.3)	57(32.4)	1.04	0.34	3.19	0.94
Household size						
HH size 2-3 people	1(6.67)	20(11.4)				
HH size 4-6 people	7 (46.7)	84(47.7)	1.7	0.19	14.3	0.6
HH size > 6 people	7 (46.7)	72(40.9)	1.9	0.22	16.7	0.5
Dietary diversity						
< 4 food groups	3(20)	11(6.3)	1			
> 4 food groups	12 (80)	165(93.8)	0.27	0.065	1.09	0.065

Discussion

Nutrition status

Stunting (HAZ) was not calculated for this sample because to assess this, a baseline for comparison would be required which had not been previously done. Since stunting is an indicator of chronic under-nutrition as a result of prolonged food deprivation and/or disease or illness it would also have been difficult to assess nutritional impact of the school meal as it had been ongoing for less than two years.

Comparing the children's nutritional status using t test revealed that there were no significant differences in the two groups. The moderately malnourished children (BMI for Age), were equally divided between the schools but there were more moderately malnourished male children than female. This may be explained by the onset of puberty and hence growth spurts which occur at around the age of 10-11years for girls and 12-13years for boys. During this period, there are increased nutrient needs which if not catered for may lead to deficiencies therefore causing malnutrition.

The results of Demerath et al (2006), suggest caution in the use of BMI percentile changes as an indicator of changes in body fatness in children. Even though BMI is a widely used epidemiological indicator, it does not attest to the difference between fat tissue and lean mass. There is evidence that lean mass consistently increases with BMI percentile, whereas fat mass and percentage of body fat have a more complex relationship with BMI percentile, depending on gender and age. A child who deviates substantially from their previous BMI percentile may not have experienced changes in adiposity but rather changes in lean body mass, particularly if the child is a male adolescent or falls at the lower BMI percentiles.

Reported morbidity

In all the illnesses reported in the children the previous two weeks, there was a significant difference in the prevalence of malaria. The reason may have been that inspite of a high percentage of households (78%) owning mosquito nets, only 65% of them reported having used the net. This use was mainly for children.

There was no relationship found between the children's nutrition status and reported morbidity in either school. Literature has shown that undernourished children are more likely to suffer ill-health than well nourished children (Gillespie, 2003; Cunha, 2000; Latham, 1997; Pelletier, 1995 and Tomkins et al, 1989), the children in this study were not undernourished hence the lack of association. Malnutrition is a health outcome as well as a risk factor for disease and aggravated malnutrition. It can increase the risk both of morbidity and mortality.

Factors contributing to being underweight

In spite of these factors contributing to or being protective of a low BMI, using a P value cut off point of <0.05, none of these factors was found to be significant. Female headed households had less education and less income than male headed ones and even though this difference wasn't significant, this meant they had fewer resources with which to improve the nutritional status of the children. Having been ill in the preceding two weeks meant that the child's nutrient intake had been compromised and without an adequate diet to replace whatever was being used to fight the illness malnutrition would occur. A household size above 6 people suggests that the resources within that household are stretched so as to cater for the increased number of people.

There is evidence that when deworming is combined with school feeding programs and micronutrient fortification or supplementation nutritional status is improved and educational achievement is increased (Bundy et al, 2009). Having a high dietary diversity means improved nutrient adequacy and under ideal conditions a satisfaction of micronutrient and energy needs.

Conclusion

There were no significant differences in the nutritional status of children from both schools investigated.

There is no association between the socioeconomic status, reported morbidity and nutrition status of the children in a school meal program compared to those not in one.

There were no factors significantly contributing to the nutritional status of children in this study.

Recommendations

WFP needs to take into account the nutrition component while designing their meal programs. This would go a long way in improving the nutritional status of the children being targeted.

Better indicators for measurement of nutritional status need to be identified to provide more accurate information especially for adolescents. This is because BMI does not attest to the difference between fat tissue and lean mass among them.

References

Bundy, D., Burbano, C., Grosh, M., Gelli, A., Jukes, M and Drake, L. (2009). **Rethinking School Feeding: Social Safety Nets, Child Development and the Education Sector.** Washington DC.

Bundy, D. A. P., Shaeffer, S and Jukes M. (2006). **School–Based Health and Nutrition Programs.** Disease Control Priorities in Developing Countries (2^{nd} Ed), New York: Pp: 1091-1108.

Cataldo, B. C., DeBruyne, K. L. and Whitney, N. L. (2003). **Nutrition and Diet therapy; principles and practice.** 6th Ed. Wardsworth, a division of Thomson learning incorporated. Kendallville, USA. Pp 182-189.

Cogil, B. (2003). **Anthropometric indicators measurement guide.** Food and nutrition technical assistance project, academy for educational development, Washington, D.C. Pp 23 – 38.

Cunha, A. (2000). **Relationship between acute respiratory infection and malnutrition in children under 5 years of age.** Acta Paediatrica. No. 89. Pp 608-609.

De Onis, M., Onyango, A. W., Borghi, E., Siyam, A., Nishida, C and Siekmann, J. (2007). **Development of a WHO growth reference for school-aged children and adolescents.** Bulletin of the World Health Organization. No. 85. Pp: 660–667

De Onis. M., Monteiro. C and Clugston, G. (1993). **The worldwide magnitude of protein-energy malnutrition: an overview from the WHO Global Database on Child Growth.** Bulleting of the WHO No. 71(6). Pp: 1 -12.

Fisher, A. A., Laing, J. E., Stoeckel, J. E and Townsend, J. W. (1991). **Handbook for Family Planning Operations Research Design.** 2nd Ed. Operations research, Population Council. New York, U.S.A. Pp: 43-46.

Kenya National Bureau of Statistics (KNBS) and ICF Macro. (2010). **Kenya Demographic and Health Survey 2008-09**. Calverton, Maryland: KNBS and ICF Macro.

Kristjansson, B., Petticrew, M., MacDonald, B., Krasevec, J., Janzen, L., Greenhalgh, T., Wells, G. A., MacGowan, J., Farmer, A. P., Shea, B., Mayhew, A., Tugwell, P and Welch, V. (2007). **School feeding for improving the physical and psychosocial health of disadvantaged pupils.** Cochrane Database of Systematic Reviews. Pp 2 – 29.

Latham, M. (1997). **Human nutrition in developing countries**. Rome: Food and Agriculture Organization.

Pelletier, D., Frongillo, E. A., Schroeder, D. G and Habicht, J. P. (1995). **The effects of malnutrition on child mortality in developing countries.** Bulletin of the World Health Organization 73. Pp 443-448.

Tomkins, A and Watson, F. (1989). **Malnutrition and infection: a review.** Geneva: World Health Organization.

United Nations Administrative Committee on Coordination (ACC), Sub- Committee on Nutrition (SCN). (1997). **Nutrition and poverty: papers from the ACC/SCN 24th session symposium, Kathmandu**. Geneva: World Health Organization.

West, K.P., Caballero, B and Black, R. E. (2006). **Chapter 5: Nutrition. International public health: Diseases, programs, systems, and policies** (2nd Edition), Sudbury, MA: Jones & Bartlett Publishers. Pp 187 – 239.

World Health Organization (WHO). (2009). **WHO AnthroPlus for personal computers Manual: Software for assessing growth of the world's children and adolescents.** Geneva. Accessed on 20th April 2010 at (http://www.who.int/growthref/tools/en/).

World Health Organization (WHO). (1995). **Physical status: the use and interpretation of anthropometry.** Geneva : technical report series No. 854.

CHAPTER 5:

CONTRIBUTION OF SCHOOL LUNCH TO ENERGY, PROTEIN AND MICRONUTRIENT INTAKES OF SCHOOL-GOING CHILDREN

Abstract:

Objective: To establish the contribution of the school meal towards energy, protein, Vitamin A, iron, zinc and iodine in the children's diet.

Design: A cross sectional study design was employed. The study was conducted in Kisauni District of Mombasa County, Kenya. A total of 191 school children were selected from two schools; one with a school meal program while the other lacked. Food measurements of raw ingredients and cooked food for the school lunch were assessed using a weighed food record. Food portions served to the children were also measured. To obtain the children's dietary adequacy a single day 24-hour recall was applied while a validated 7-day food frequency questionnaire was used to assess food intake.

Results: 24hr recall data revealed that the diet of the children in both schools was low in vitamin A and iodine. No significant differences were found in the nutrient adequacy of the children in the two school areas. The school weighed food record revealed that the mean energy intake was 560.5Kcal/ child and 10.8g of protein/child. The school meal contribution to the children's RDA was highest in Vitamin A-96% and lowest in iodine and iron. This contribution to RDA was highest when the children were on holiday tuition than when the school was back in session.

Conclusion: The school meal was found significantly able to meet the children's vitamin A RDA, a nutrient that was deficient in their home diet. The food portions served to the children were found to be inadequate and therefore, there is need for the SMP school to come up with a standardised way of serving food portions to the children if they are to meet the energy and nutrient requirements they are supposed to. WFP and policy makers ought to collaborate in designing school meal programs with a nutrition component in mind in order to improve the nutrient adequacy of the school meal.

Introduction

Good health and adequate nutrition promote both physical growth and learning. School feeding programs are one of several interventions that can address the nutrition and health problems of school children (ACC/SCN, 1998). Meeting the nutrition and educational needs of children is critical to supporting their healthy growth and development. To provide all the needed nutrients, a child's meals and snacks should include a variety of foods from each food group in adequate amounts suited to the child's appetite and nutritional needs (Cataldo et al, 2003).

According to Grantham-McGregor (1995), hunger and malnutrition among children in developing countries are major contributors to the impairment of health, quality of life, and survival. A poor diet leaves children susceptible to illness through a poor immune system. Greater illness results in more days absent and further a decrease in teacher contact hours which may result in decreased performance (Belot and James, 2009). Poor height for age, poor weight for age, iron deficiency anaemia, iodine deficiency disorders and vitamin A deficiency are the main nutritional problems facing the school children (Grantham-McGregor, 1995).

Meal programs should be well-designed to provide sufficient energy, protein, fat and micronutrient content for children's age and baseline nutritional status. Palatability and special needs of the target population are also extremely important to consider. Food should be appealing, acceptable, and locally available (Kristjansson et al, 2007).

Micronutrient deficiencies affect nearly two billion people worldwide (WFP, 2010). Deficiencies of iron, vitamin A, iodine, and zinc among children are the most devastating in terms of impaired development and mortality. Iron deficiency is the most common form of micronutrient deficiency in school children (Hall et al 2001). More than half the school children in low-income countries are estimated to suffer from iron deficiency anaemia (Bundy et al, 2006).

Iodine deficiency affects an estimated 1.6 billion people worldwide with an estimated 60 million being school children in the developing world. It is also associated with lower test scores and cognitive abilities. Studies of iodine deficiency indicate that between 35 and 70 percent of school children in developing countries may be iodine deficient (Bundy et al, 2006). The consequences of iodine deficiency include severe mental retardation, goitre, hypothyroidism, abortion, stillbirths and low birth weight and mild forms of motor and cognitive deficits.

Vitamin A deficiency is a major public health problem which affects an estimated 85 million school children (Bundy et al, 2006). The deficiency impairs immune function and increases the risk of dying from diarrhoea, malaria, and measles. It is the leading cause of child blindness in developing countries and also contributes to growth failure and weakened immunity in young children which results in 800,000 child deaths per year (WFP, 2010).

The objective of this study was to establish the contribution of the school meal towards energy, protein, Vitamin A iron, zinc and iodine in the children's diet and associated co-morbidities.

Research methods

Study area

Kisauni District is situated in the Mombasa County of the Coastal region of Kenya. The District is on the north of Mombasa Island. It is at an average altitude of 1 meter. It covers an area of 109.7km $^{2.}$ It has 3 divisions. The main agricultural activities include fishing in the ocean, small scale/subsistence farming, palm tree cultivation, dairy keeping and a lot of poultry farming. School feeding is widespread in all areas of the District, income levels are low and food shortages are frequent within the area.

Study population

The study sample comprised of children aged 6 to 18 years, attending a public school within Kisauni. In Kisauni District the schools are subdivided into two main areas: Kengeleni and Bamburi. The total number of public schools in the District is 24. Most of the schools in the feeding program are situated in the slum areas and settlements where poverty and unemployment of parents is rampant. Selection of these schools is done by a representative of the United Nations (UN) WFP which also funds the feeding program.

Study design:

This was a cross-sectional study that was conducted between August and October 2010. It incorporated both qualitative and quantitative research approaches.

Sample size and sampling procedures

A sample size of 191 children was used (110 participating in a feeding program and 81 non-participants). The non-participants were less as some households that had been selected declined to respond and by that time the children were engaged in end term exams and could not be accessed. The sample size was determined using the Fisher formula (Fisher et al., 1991). The sampling at the District level was done purposively. Public schools in the District were divided into two categories; schools with a feeding program and those without. Two schools were then randomly sampled from the two categories. In both schools, the school registers of all children in class two to seven with information on age and sex were obtained. Finally, one hundred and ninety one children were selected from the schools using proportionate sampling in each class.

Data collection procedures and instruments

Permission to carry out the study was obtained from the National Council of Science and Technology – Ministry of Higher Education Science and Technology. Permission was also sought from the Municipal Education Office-Mombasa Municipality. Parents were requested for an informed consent after the purpose and objectives of the study were clarified to them, and all information collected on each individual was held in confidence.

A 24 hour dietary recall questionnaire was used to interview respondents to obtain information on dietary intake over the previous 24hours. First it was determined that the previous 24 hour period was normal for the household. Then food measurements were performed using a Salter kitchen food scale. The food scale was used to weigh particular foods or volumes equivalent to them to facilitate the conversion of HH food measures to grams. This provided information on adequacy of the specified nutrients in the selected children's diet. These questionnaires were administered to 61 children.

A weighed food recall was conducted at the school. All the ingredients used in the food were measured together with the cooked end products. This was done twice; during the school holiday tuition and when the school resumed session. The bowls that different children used to collect food and the amount of food served to the children was also weighed at the serving points.

Data analysis

24 hour recall and weighed recall data was entered into Nutrisurvey for windows software 2007. This professional nutrition software contains a food database and provides nutrient analysis and calculation of energy and nutrient requirements for individuals. It was able to analyse whether the children were meeting their RDA or not based on their age and sex requirements. The analysis obtained from the Nutrisurvey software was then exported to Word as a report for the children. This made it easy to pick out the nutrients of interest to this study.

Results

Nutrient adequacy of the children diets

The 24-hour recalls conducted in the households focused on energy, protein, iron, vitamin A, zinc and iodine. The nutrient adequacy between the schools is presented in table 10.

Table 10: Nutrient adequacy between the schools

	Feeding program (n=110)	No feeding program (n=81)
RDA	n(%)	n(%)
Energy		
≤RDA	19(17.3)	12(14.8)
≥RDA	13(11.8)	17(21)
Nutrients		
Protein		
≤RDA	20(18.2)	18(22)
≥RDA	12(10.9)	11(13.6)
Iron		
≥RDA	32(29.1)	29(35.8)
Vitamin A		
≤RDA	31(28.2)	28(34.6)
≥RDA	1(0.9)	1(1.3)
Zinc		
≤RDA	26(23.6)	23(28.4)
≥RDA	6(5.4)	6(7.4)
Iodine		
≤RDA	31(28.2)	27(33.3)
≥RDA	1(0.9)	2(2.5)

Nutrient adequacy between the schools

No significant differences were found in the nutrient adequacy of the children in the two school areas. The results are presented in table 10.

Table 11: Comparing nutrient adequacy using t test

Variable	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
% of Energy RDA consumed	-1.772	47.720	0.083	-23.000	12.980	-49.102	3.102
% of Protein RDA consumed	0.174	58.928	0.863	2.523	14.507	-26.506	31.552
% of Iron RDA consumed	-1.306	52.385	0.197	-181.211	138.763	-459.610	97.187
% of Vitamin A RDA consumed	-.723	29.647	0.475	-35.56250	49.17897	-136.04951	64.92451
% of Iodine RDA consumed	-.333	52.753	0.741	-2.640	7.931	-18.549	13.268
% of Zinc RDA consumed	0.009	57.824	0.993	0.114	12.173	-24.253	24.482

School weighed food record

Two weighed recalls were conducted at the SMP school; once during the holiday tuition and when the full school was in session. Intake was also assessed based on the minimum and maximum plate sizes observed. During these occasions a different number of pupils was taken into account.

Table 12: Weighed food record results

	Consumption per child		
	Mean intake	**Intake based on plate size**	
		Max serving	Min serving
Holiday tuition		**700g**	**225g**
	(Approx 190 children)	**(Approx 140 children)**	**(Approx 50 children)**
Energy	957.5kcal	1299 kcal	3638 kcal
Nutrients			
Protein	17.97 g	24 g	68.3 g
Iron	1.6 mg	2.2 mg	6.2 mg
Vitamin A	4605µg	6250 µg	17500µg
Zinc	1.7 mg	2.4 mg	6.6 mg
Iodine	15.8 µg	21.4 µg	60 µg
School in session	***650 pupils***	**(Approx 252 children)**	**(Approx 136 children)**
Energy	560.5kcal	1445.7 kcal	2679 kcal
Nutrients			
Protein	10.8g	28 g	51.8 g
Iron	1mg	2.7 mg	5.1 mg
Vitamin A	1735 µg	4475 µg	8292 µg
Zinc	1.16 mg	3 mg	5.55 mg
Iodine	10.6 µg	27 µg	50.4 µg

Contribution of school meal to RDA

Table 13 indicates the overall percentages that the lunch meal contributed to the children's RDA. During the holiday tuition, the meal contributed more than when the full school was in session. Of all the nutrients, the meal contributed the most to the Vitamin A RDA.

Table 13: Contribution of school meal to RDA

	Mean RDA for children aged 6-18 years	Percentage contribution of school meal to RDA	
		Holiday tuition	**Full school**
Energy	2111kcal	46%	26.5%
Protein	37.7 g	48%	28.6%
Iron	11.5g	14%	8.7%
Vitamin A	1800 microgram	256%	96%
Zinc	8 milligram	21%	14.5%
Iodine	120 microgram	13%	8.8%

Discussion

Nutrient adequacy of the children diets

The children's dietary intake was analysed depending on their age and sex to determine if they were meeting their RDA or not. The nutrient whose RDA was met by majority of the study participants was iron with none of the children consuming below their RDA. The reason for this could have been because the children were consuming a lot of iron rich foods in their diet. The nutrients with many pupils still not meeting their RDA were iodine and vitamin A. The children's diet was low in fruits and vitamin A rich vegetables and tubers and preformed vitamin A such as eggs, milk and liver. This could be the reason they were not meeting their vitamin A RDA. Even though most of the salt in Mombasa County is iodized, it is possible that the households interviewed may have been lying about using iodized salt. Their method of storing the salt might also have played a part as many respondents were not aware of the volatile nature of the mineral.

According to FAO/WHO (2001), rapid growth in stature, muscle mass and fat mass during adolescence results in greater daily requirement for iron and vitamin A than among persons of other age groups. If these nutrients are not replaced by the diet or supplementation, a deficiency occurs. As Jukes et al (2008) explains, a deficit of vitamin A impairs immune function and iron metabolism and increases the risk of mortality from infectious disease, and if left untreated, eventually causes blindness. Ahmed et al (1997), clarifies that the obvious underlying cause for the poor status of vitamin A nutrition is the diet lacking adequate amounts of vitamin A.

School weighed food recall

School meals make a significant and positive contribution towards reducing pupils' hunger and improving nutritional intake. However, the children's mean intake of the school food did not fulfil its estimated nutrient provisions of 703.25 calories, 13.5 grams of protein as elaborated by Lambers (2009).

When the full school was in session, children obtained lower amounts of nutrients than those expected to be provided especially from energy and protein. A key informant interview with a WFP representative revealed that nutrition was not a factor considered in the selection of the school feeding items. He explained that the organization had no specific way of knowing whether the school meal program (SMP) was improving the targeted children's nutrition status. He further explained that the foods to be used in the SMP's are not selected by WFP but are dependent on what is received from donors.

Observations at the school revealed there was no proper serving method. Cooks used their eyes to estimate measures. Food portions were approximated using the physical size of the child, the size of the bowl the child had, the class of the child and interest of the child in the food. Focus group discussions with the pupils revealed they felt the food portions served were not enough especially for the older children. They preferred a standardised method of service. The pupils also felt there was discrimination in food service as only pupils in the upper classes were allowed to serve food.

There was also no proper way of knowing if all the children had eaten food cooked that day as some opted not to. Focus group discussions with the children also revealed that they did not like the lentils and preferred to purchase beans as an alternative. This therefore meant that the food might not be as beneficial to the children as previously expected.

A key informant interview with the teacher in charge of school feeding revealed that WFP uses a measurement of 150g of maize, 5g of oil and 40g of pulses to estimate servings per child. This is then multiplied by the number of enrolled pupils that school term (as per the register) and the number of school days in that school term. This figure is then used to subtract the balance of food remaining from the last school term. This being an average figure, it may not cater for the specific needs of the children according to their different ages, physical activities and body weight.

Contribution of school meal to RDA

While the evidence related to improvements in overall nutritional status is weak, there is good evidence to suggest that school feeding programs, when designed with micronutrients in mind, can greatly improve micronutrient status (WFP, 2004). The three main micronutrients that SMPs can impact are iron, Vitamin A and iodine, all of which have been linked to learning capacity. Out of these, the children in this study would benefit a lot from the improvement of Vitamin A and iodine as their diet is lacking in these.

When it came to RDA, the school meal contributed more during the holiday tuition, than when the full school was in session. Of all the nutrients, the meal contributed the most to the RDA of Vitamin A. This was a significant contribution considering the deficiency of this vitamin in these children's diet. Energy and protein came close to providing half of RDA during the holiday tuition session. These results indicate that the children who came for holiday tuition stood a better chance of having improved nutrition from the school meal than when all the children were back in school. The school meal contribution also indicates that in spite of the children in the SMP having to pay for the meal, they are at a better position compared to their counterparts in the Non SMP school. Their home diet is improved and supplemented by the school meal.

An evaluation carried out by WFP (WFP, 2010) assessed the value of the school meal in meeting the RDA of energy, protein, Vitamin A, iron and iodine. It revealed that less than 10% of children surveyed had consumed the RDA of the target nutrients (except Vitamin A) in the previous day. This was contrary to what the current study found, that the children were able to meet their

Vitamin A RDA with the school meal only. According to WFP, school meals accounted for more than half of the RDA attained by 40% of students. This differed with the current study which revealed the school meal accounted for less than 30% (energy, protein), less than 20% (zinc) and less than 10% (iron and iodine) of the RDA. This might have been because the children were getting similar portions in spite of their differences in activity levels, age, body weight and sex.

The current study discovered that school lunch provided the largest meal of the day for many children and frequently the only meal. Some children carried home what was left over of their meal to share with siblings. This meant they might have been consuming less of the meal at school so that the siblings at home could benefit. WFP findings agreed with this and indicated that school meals provided important access to nutritious food, but did not compensate for inadequate dietary intake at home, especially among poor rural children. Many households prepared less food at home when a child received a school meal (WFP, 2010).

Conclusion

There were no significant differences in the dietary patterns of children from both schools. The children's diet was poor in Vitamin A and iodine.

The school meal was found significantly able to meet the children's vitamin A RDA.

Recommendations

To improve school meal programs and ensure they enhance the children's nutrient status they ought to be designed with a nutrition component in mind.

There is need for the SMP school to come up with a standardised way of serving food portions to the children if they are to meet the energy and nutrient requirements they are supposed to.

WFP ought to use a different method (other than averages) to calculate the portions per pupil as this could be misleading in some cases.

Before implementation of the program, WFP ought to investigate the children's situation at home to ensure that the food they are receiving at school does not end up being shared by the whole family with the targeted child not benefiting. This is because some of the children carry their share of food home.

References

Ahmed, F., Hasan, N and Kabir, Y. (1997). **Vitamin A deficiency among adolescent female garment factory workers in Bangladesh.** Eur J Clin Nutr No. 51. Pp: 698-702.

Fisher, A. A., Laing, J. E., Stoeckel, J. E and Townsend, J. W. (1991). **Handbook for Family Planning Operations Research Design.** 2nd Ed. Operations research, Population Council. New York, U.S.A. Pp: 43-46.

Food and Agriculture Organization (FAO)/World Health Organization (WHO). (2001). **Human Vitamin and Mineral Requirements.** Report of a Joint FAO/WHO Expert Consultation, Bangkok, Thailand. Bangkok: FAO/WHO.

Jukes, M., Drake, L. and Bundy, D. (2008). **School health, nutrition and education for all: Leveling the playing field.** Wallingford, Oxfordshire. Pp: 28.

Lambers, W. (2009). **Fighting hunger in Kenya with school meals.** Accessed on 1st July 2010 at http://www.examiner.com/global-hunger-in-national/fighting-hunger-kenya-with-school-meals.

WFP (Office of evaluation). (2010). **Impact Evaluation of WFP School Feeding Programmes in Kenya (1999-2008): A Mixed-Methods Approach.** Evaluation brief. Vol Accessed at http://home.wfp.org/stellent/groups/public/documents/reports/wfp230095.pdf

WFP, (2004). **School Feeding Programs: Why They Should be Scaled Up Now.**

CHAPTER 6:

DIETARY DIVERSITY AND NUTRIENT ADEQUACY OF SCHOOL-GOING CHILDREN AGED 6-18 YEARS IN KISAUNI DISTRICT

Abstract:

Objective: To assess the dietary diversity and nutrient adequacy of children in a school feeding program while comparing them to those not in a school feeding program.

Design: A cross sectional study design was employed. The study was conducted in Kisauni District of Mombasa County, Kenya. A total of 191 school children were selected from two schools; one with a school meal program while the other lacked. Dietary intake data was acquired using a validated 7-day food frequency questionnaire, 24Hr recall and a dietary diversity questionnaire comprising of 8 food groups. To estimate the nutrient adequacy of the diet, a nutrient adequacy ratio (NAR) was calculated for energy and 5 nutrients (vitamin A, iron, zinc, protein and iodine). The mean adequacy ratio (MAR %) was calculated as a measure of the adequacy of the children's overall diet.

Results: The mean number of food groups consumed by children in both schools was 6 (SMP school 6 (SD±1.8) and Non SMP school 6 (SD±1.6)). A t test revealed that there were no significant differences in the dietary diversity between children from the two schools. From the food frequency data, no significant difference was found in the food consumption patterns of the children. There was a significant association ($P=0.005$, $\chi^2=18.67$) between dietary diversity and being underweight. There was also a significant relationship ($P=0.025$, $\chi^2=31.5$) between the children's dietary diversity and birth order. The nutrient adequacy ratios for children in both schools were highest for energy and protein while the mean adequacy ratio was higher for children from the Non SMP school. This difference was however not significant.

Conclusion: The school meal's contribution to the children's dietary diversity was one extra food group which placed them at an advantage compared to their Non SMP counterparts. There is need to review the food provided as the school meal if the children's diet diversity is to be increased through the meal.

Introduction

Dietary diversity is a simple count of food items or food groups used in households or by individuals over a certain time period. It has been considered a potential 'proxy' indicator to reflect nutrient adequacy (Ruel, 2002). The count has been proposed as a food security indicator that measures household or individual level access to food (Hoddinnott and Yohannes, 2002). It can also serve as an indicator of the nutritional adequacy of diet in relation to growth and other health outcomes (Onyango, 2003). Under ideal conditions of food access and availability, food diversity should satisfy micronutrient and energy needs of the general population. Unfortunately, for many people in the world, access to a variety of micronutrient-rich foods is not possible (FAO and WHO, 2001).

Monotony in diet is considered the hallmark of poverty and poor nutrition (Golden, 1991) and typical child diets in communities and households with high rates of malnutrition are monotonous and bulky. Apart from supplying inadequate amounts of nutrients, these diets have poor organoleptic qualities that further diminish appetites already suppressed by physiological nutrient deficiencies (Golden, 1991). The need for variety is imposed by the body's physiological requirements. Poor diets deficient in nutrients may be said to reinforce the malnutrition-infection cycle and contribute to overall poor health and sub-optimal growth (Onyango, 2003).

The household dietary diversity score (HDDS) is meant to reflect, in a snapshot form, the economic ability of a household to consume a variety of foods. Studies have shown that an increase in dietary diversity is associated with socio-economic status and household food security (household energy availability) (Hoddinot & Yohannes, 2002; Hatloy et al, 2000). A more diversified diet is highly correlated with such factors as caloric and protein adequacy, percentage of protein from animal sources (high quality protein), and household income. Even in very poor households, increased food expenditure resulting from additional income is associated with increased quantity and quality of the diet (Swindale and Bilinsky, 2006).

Lack of diet diversity and a high prevalence of infection in many developing countries can contribute to inadequate micronutrient status (Adelman et al, 2008). This is particularly a severe problem among poor populations in the developing world, where diets are based predominantly on starchy staples and often include few or no animal products and only seasonal fruits and vegetables. Families with greater incomes and resources tend to have more diverse diets, but they are also likely to have better access to health care and better environmental conditions. Clearly, children in wealthier households are better off and grow better for a number of reasons, but improved nutrient adequacy may be one important way in which household wealth and resources translate into better outcomes for children (Arimond and Ruel 2004).

The objective of this study was to assess the dietary diversity and nutrient adequacy of children in the schools studied.

Research methods

Study area

Kisauni District is situated in the Mombasa County of the Coastal region of Kenya. The District is on the north of Mombasa Island. It is at an average altitude of 1 meter. It covers an area of 109.7km $^{2.}$ It has 3 divisions. The main agricultural activities include fishing in the ocean, small scale/subsistence farming, palm tree cultivation, dairy keeping and a lot of poultry farming.

School feeding is widespread in all areas of the District, income levels are low and food shortages are frequent within the area.

Study population

The study sample comprised of children aged 6 to 18 years, attending a public school within Kisauni. In Kisauni District the schools are subdivided into two main areas: Kengeleni and Bamburi. The total number of public schools in the District is 24. Most of the schools in the feeding program are situated in the slum areas and settlements where poverty and unemployment of parents is rampant. Selection of these schools is done by a representative of the United Nations (UN) WFP which also funds the feeding program.

Study design:

This was a cross-sectional study that was conducted between August and October 2010. It incorporated both qualitative and quantitative research approaches.

Sample size and sampling procedures

A sample size of 191 children was used (110 participating in a feeding program and 81 non-participants). The non-participants were less as some households that had been selected declined to respond and by that time the children were engaged in end term exams and could not be accessed. The sample size was determined using the Fisher formula (Fisher et al., 1991). The sampling at the District level was done purposively. Public schools in the District were divided into two categories; schools with a feeding program and those without. Two schools were then randomly sampled from the two categories. In both schools, the school registers of all children in class two to seven with information on age and sex were obtained. Finally, one hundred and ninety one children were selected from the schools using proportionate sampling in each class.

Data collection procedures and instruments

Permission to carry out the study was obtained from the National Council of Science and Technology – Ministry of Higher Education Science and Technology. Permission was also sought from the Municipal Education Office-Mombasa Municipality. Parents were requested for an informed consent after the purpose and objectives of the study were clarified to them, and all information collected on each individual was held in confidence.

To obtain data on dietary diversity, the Individual Dietary Diversity Score (IDDS) recommended by the U.N. Food and Agriculture Organization (Swindale and Bilinsky, 2006) was used for this study. A questionnaire on dietary diversity was used to obtain answers at the household level. To better reflect a quality diet, the number of different food groups consumed by the specific child was determined using foods indicated as consumed and calculated using the household dietary diversity score.

A food frequency questionnaire with a list of foods was used to report on how often certain foods and drinks were consumed. The respondents indicated what types of food they ate and how often they ate them. With this information, they then indicated the most appropriate frequency option for each of the foods or drinks by marking on the questionnaire.

24hour recall questionnaires were also administered to 61 children to provide quantitative information on dietary diversity and nutrient adequacy at the child level. Information was recorded on all the foods and drinks consumed by the child including the amounts taken during the previous 24 hours. Questions on food intake were asked and food measurements were performed. This provided information on adequacy of the specified nutrients in the selected child's diet.

Probing was employed to gather information on forgotten foods, including a detailed description of the food or drink and the ingredients used in preparation. In order to facilitate the estimation of portion sizes, household utensils, life-size drawings and generic food models were used.

Data analysis

Dietary diversity was defined as the number of different foods or food groups consumed by each child over a given reference period (Hoddinot & Yohannes, 2002). The individual dietary diversity score (IDDS) used in this study included eight groups as recommended by the U.N. Food and Agriculture Organization (Swindale and Bilinsky, 2006). The individual dietary diversity score (IDDS) is used as a proxy measure of the nutritional quality of an individual's diet. The maximum score was 8, with one point given for each group consumed during the study period. Dietary diversity scores were created by summing the number of food groups consumed over a reference period. The dietary diversity scores consisted of a simple count of food groups that a child had consumed over the past 24 hours.

To determine nutrient adequacy of the diet, nutrient adequacy ratio (NAR, %) was calculated for each of the four micronutrients (vitamin A, iron, iodine and zinc), energy and protein. NAR was calculated as the intake of a nutrient divided by the recommended intake for that nutrient (RNI). The NAR of the average daily intake of protein and the selected vitamins was calculated on the basis of the American Food and Nutrition Board Dietary Allowances (US IOM, 2000) while for energy WHO recommended intakes were used (FAO and WHO, 2001). The mean adequacy ratio (MAR, %) was calculated as a measure of the adequacy of the overall diet, where MAR is the sum of each NAR (truncated at 100%) divided by the number of nutrients (excluding energy and protein) (Hatloy et al, 1998). Since most zinc and iron from plant sources is not readily bioavailable, the category for moderate bioavailability was used.

The dietary diversity and food frequency data collected was then entered into SPSS 16.0 for windows (SPSS Inc., Chicago IL, US) for cleaning and then analysis. The 24 hour recall data was entered into Nutrisurvey for windows software 2007. This software was able to analyse whether the children were meeting their RDA or not based on their age and sex requirements.

In this evaluation, there were some foods consumed not available in the Nutrisurvey software, and therefore it was necessary to make additions. These were made from the book: The composition of foods commonly eaten in East Africa (CTA and ECSA, 1988). The Nutrisurvey software used relies on the WHO/FAO Recommended Daily Allowance (RDA) for comparative standards. The software only gives information on the proportion of the RDA achieved through nutrient intake from all the meals taken in the day. One limitation is that it does not generate information regarding the contribution of each meal to the RDA. The analysis obtained from the Nutrisurvey software was then exported to Word as a report for individual children. This made it easy to pick out the nutrients of interest to this study.

Results

Dietary diversity versus school

The number of food groups consumed was divided into three groups; less than 4, 4 food groups and more than 4. The mean number of food groups consumed by children in the study was 6. In the SMP school the mean number was 6 (SD±1.8) and in the second school it was 6 (SD±1.6). The minimum number of food groups consumed was 1 and the maximum was 11.

Comparing the dietary diversity means using t test

A t test carried out to compare the dietary diversity between the two schools revealed that there were no significant differences between children in the two schools. The results are displayed in table 14.

Table 14: Dietary diversity means using t test

Variable	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Dietary diversity	0.162	170.99	0.872	0.014	0.085	-.155	0.182

Food frequencies

The frequency of commonly consumed foods was categorized into food groups as the children identified how often they consumed foods from different groups. Using a t test, there was no significant difference in the food consumption patterns of the children.

Table 15: Comparing food frequencies between schools

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Cereal and cereal products	-1.067	186.217	0.287	-.061	0.057	-.174	0.052
Milk and milk products	-.226	170.288	0.822	-.028	0.123	-.270	0.215
Oils and fats	-1.929	188.905	0.055	-.110	0.057	-.223	0.003
Meat and meat products, Chicken and products	-1.801	151.761	0.074	-.169	0.094	-.355	0.016
Legumes, Pulses and nuts	-.540	170.032	0.590	-.060	0.111	-.278	0.159
Roots and tubers	-1.579	180.874	0.116	-.185	0.117	-.416	0.046
Vegetables	-.977	173.914	0.330	-.064	0.065	-.192	0.065
Fruits	1.200	184.259	0.232	0.133	0.111	-.086	0.353
Eggs	0.732	180.914	0.465	0.046	0.063	-.078	0.170
Fish and sea products	0.354	178.316	0.724	0.041	0.117	-.189	0.271

Dietary diversity versus child birth order

There was a significant association ($P=0.025$, $\chi^2=31.5$) between the children's dietary diversity and birth order. The birth order with the best dietary diversity was 2 and 6. The birth order with the worst dietary diversity was 5 and 8. These results are displayed in figure 2.

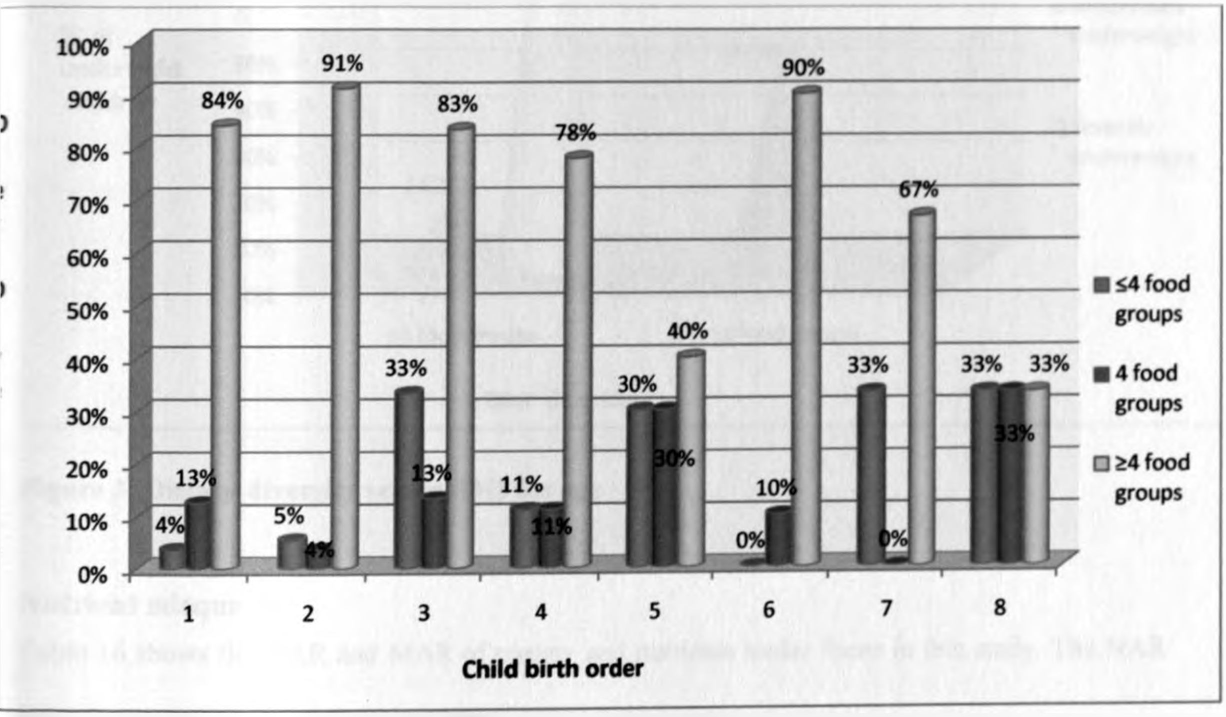


Figure 2: Dietary diversity versus birth order

Dietary diversity versus BMI for age

There was a significant difference ($P=0.005$, $\chi^2=18.67$) between dietary diversity and being underweight. There were no severely underweight children who consumed more than 4 food groups. Figure 3 displays these results.

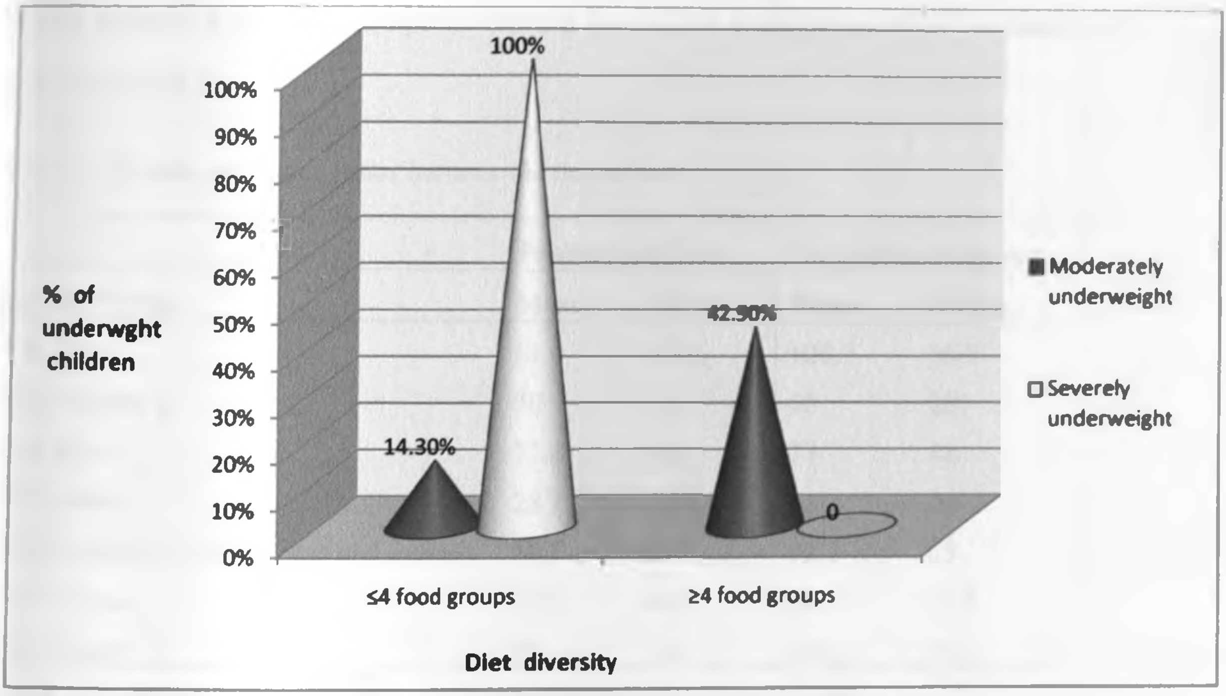


Figure 3: Dietary diversity versus BMI for age

Nutrient adequacy

Table 16 shows the NAR and MAR of energy and nutrients under focus in this study. The NAR was highest for energy, protein and iron.

Table 16: Overall nutrient adequacy ratios of selected nutrients

Variable * (%)	Mean	SD (±)
NAR Iron	90.7	52.7
NAR Vitamin A	47.3	182.4
NAR Zinc	77.5	47
NAR Iodine	29.9	30.3
MAR (Vitamin A, Iron, Zinc and iodine)	90.7	52.7
NAR Protein	93	56.5
NAR Energy	103.9	50.6

***NAR = Nutrient adequacy ratio** **MAR = Mean adequacy ratio**

Nutrient adequacies were also compared between the children in the two schools. The results are presented in table 17.

Table 17: Nutrient adequacy ratios between the two schools

	Feeding program		No feeding program	
Variable * (%)	**Mean**	**SD (±)**	**Mean**	**SD (±)**
NAR Iron	81.6	53.6	100.7	50.7
NAR Vitamin A	30	47	66	261
NAR Zinc	77.6	46	77	48
NAR Iodine	28.7	26.7	31	34
MAR (Vitamin A, Iron, Zinc and iodine)	89.3	51.3	92.2	55
NAR Protein	94.3	60.5	91.8	52.8
NAR Energy	93	39	116	59.2

***NAR = Nutrient adequacy ratio** **MAR = Mean adequacy ratio**

Using t test, the MAR percentage was not significantly different between the two schools.

Table 18: Nutrient adequacy ratios between the two schools

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Mean Adequacy ratios	-.205	57.3	0.839	-2.79	13.67	-30.179	24.58

Discussion

Dietary diversity by school

The dietary diversity of both areas assessed was high (> 4 food groups). This may have been influenced by the Ramadhan season during which the study was conducted. During this season, an adequate supply of food is readily available at an affordable price. Majority of the people eat socially and those without food to eat are given. It is difficult to tell if people have no food. This contrasts to the non-Ramadhan period during which households may not have food and children are likely to depend on school food only. The high dietary diversity may also be due to the fact that the children are not able to make their own food choices but rely on what is provided at home.

Even though the diversity was high, food frequency data indicated the most commonly consumed food groups were cereals, sugar, oils/fats and vegetables. This may have been due to the ease in availability of bread-grain products within the District, the belief that breakfast beverages cannot be taken without sugar, oils and fats were used widespread for cooking and vegetables were used instead of legumes, pulses and other proteins. Meat and chicken and fruits, eggs and fish and sea products were the most rarely consumed among this study group. From the food frequency data, it can be concluded that these children's diet was poor in protein rich foods. These findings were contrary to what Mirmiran et al (2004) found in a study in Tehran; in which fruit and bread-grain groups had the highest and the lowest scores respectively among adolescents. The study concluded that the contrasts could be due to different methods used for scoring dietary diversity.

The results of the study by Hatloy et al (1998) show that food and dietary scores can identify fairly well the children with an inadequate nutrient intake. Their study speculated that a high dietary diversity score, will reflect consumption of foods from several food groups, and such a diet may also have a higher nutritional quality. Nutritional status improves with dietary diversity even though this improvement in nutritional status may be due to factors such as good healthcare, improved income or a better hygienic environment which were not explored in detail in this study.

Comparing dietary diversity means using T test

Using T test, we failed to reject the null hypothesis which stated that; "there were no differences in the dietary diversity between the children in the two schools". This test indicated that there were no differences in the dietary diversity between children in a feeding program and those not in one.

Contribution of school meal to dietary diversity

The school meal's contribution to dietary diversity was very minimal. In total, the school lunch fulfilled three food groups; the legume group, cereals and oils & fats. Considering the children's diet was already high in cereals, oils and fats, the contribution from the school meal was in only one food group: the legume group. This was nonetheless a significant contribution because the children were consuming very few foods if any, from this group. It placed the children in the SMP school at a slight advantage compared to their Non SMP counterparts when it came to dietary diversity.

Dietary diversity and child birth order

Children whose birth order was second or sixth had the highest dietary diversity. This significant difference in the children's dietary diversity versus birth order may be explained by the fact that majority of the children in this study had a birth order of 1 and 2. This meant that the households investigated were either having smaller families or they were taking their time before having more children. The peak in dietary diversity at the second child could be due to the need to better take care of the second child in a way the first child was not taken care of. The decline in dietary diversity from the third child may be due to dwindling resources not enough to cater for the increasing family and perhaps a lack of interest on the side of the parents. The increase in dietary diversity again at the sixth child may be due to renewed child interest by the parents. It could also be because that maybe the last child the couple is expecting to have and therefore the need to raise it very well.

Dietary diversity and BMI for age

A significant association was found (P=0.005, χ^2=18.67) between dietary diversity and being underweight in this study. In developing countries and particularly in Africa, a relationship between dietary diversity scores and individuals' nutritional status similar to the one found in this study has already been shown several times (Onyango et al, 1998; Tarini et al, 1999; Hatloy et al, 2000; Arimond & Ruel, 2002).

According to Savy et al, (2005) there is a significant link between dietary diversity scores and nutritional outcomes. Their study confirmed that the indicators of dietary diversity score (DDS) and food variety score (FVS) adequately predicted the nutritional status of their study subjects. In that study, there was a link between the dietary diversity score and the percentage of underweight women. Since women's nutritional status is much more stable than that of growing children, it was assumed that it was more difficult to show this kind of relationship in their study.

Nutrient adequacy

Iodine had the lowest NAR while energy, protein and iron had the highest. This was consistent with the nutrient adequacy data collected in the children's households indicating that only a few of them were meeting their iodine RDA. Overall, the children had attained their energy RDA and were very close to attaining their protein RDA. The children may not have been able to meet their iron RDA's because of bioavailability. Zinc, niacin, iron, and provitamin A carotenoids are nutrients with well-known issues of bioavailability. The distribution of nutrient intakes also may be inaccurate if bioavailability varies within the population but is not considered when nutrient intake is estimated for each individual.

The MAR for the children was 61.35 percent. A MAR of 100 percent indicates that the intake of all nutrients is equal to or above the recommended intake while a MAR of below 100 percent indicates lower than the recommended intake.

Conclusion

The school meal's contribution to the children's dietary diversity was one extra food group which placed them at an advantage compared to their Non SMP counterparts.

There were no significant differences in the food consumption patterns and nutrient adequacy between children in the two schools.

There was a relationship between children's birth order, BMI for age, and dietary diversity.

Recommendations

Further studies need to be carried out in the same study area during a time that is not Ramadhan to find out if the dietary diversity results obtained will be different.

The community ought to beef up the school meal by providing fruits and vegetables where possible to improve the school meal and improve nutrient adequacy more.

References

Adelman, S. W., Gilligan, D. O. and Lehrer, K. (2008). **"How effective are food for education programs?: A critical assessment of the evidence from developing countries,"** Food policy reviews 9, International Food Policy Research Institute (IFPRI).

Arimond, M. and Ruel M.T. (2004). **Dietary diversity is associated with child nutritional status: evidence from 11 demographic and health surveys.** J Nutr.;134. Pp 2579–2585.

Arimond, M. and Ruel, M.T. (2002). **Progress in developping an infant and child feeding index: an example using the Ethiopia Demographic and Health Survey 2000.** FCND Discussion Paper no 143 Washington, DC: IFPRI.

CTA and ECSA. (1988). Technical center for agricultural and rural cooperation and food and nutrition cooperation: **The composition of foods commonly eaten in East Africa**. Ed; West, C. E, Pepping, F and Temaliwa, C. R. Wagenigen Agricultural university.

FAO and WHO (Food and Agriculture Organization/World Health Organization). (2001). **Human Vitamin and Mineral Requirements. Report of a Joint FAO/WHO Expert Consultation.** Bangkok, Thailand.

Fisher, A. A., Laing, J. E., Stoeckel, J. E and Townsend, J. W. (1991). **Handbook for Family Planning Operations Research Design.** 2nd Ed. Operations research, Population Council. New York, U.S.A. Pp: 43-46.

Golden, M.H.N., (1991). **The nature of nutritional deficiency in relation to growth failure and poverty.** Acta Paediatr. Scand. Suppl. 374. Pp 95–110.

Hatloy, A., Hallund, J., Diarra, M. M. and Oshaug, A. (2000). **Food variety, socioeconomic status and nutritional status in urban and rural areas in Koutiala (Mali).** Pub Health Nutr No. 3. Pp: 57-65.

Hatloy, A., Torheim, L. E and Oshaug, A. (1998). **Food variety – a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa.** Eur J Clin Nutr No. 52. Pp 891– 898

Hoddinott, J. and Yohannes, Y. (2002). **Dietary diversity as a food security indicator.** Food and Nutrition Technical Assistance Project, Academy for Educational Development, Washington, D.C. obtained at http://www.aed.org/Health/upload/dietarydiversity.pdf

US Institute of Medicine (IOM) and Food and Nutrition Board. (2000). **Dietary reference intakes Vitamin A, Iodine, Iron and Zinc.** A Report of the Panel on Micronutrients, Subcommittees on Upper Reference Levels of Nutrients and of Interpretation and Uses of Dietary

Reference Intakes, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes. Pp: 1326-1331

Mirmiran, P., Azadbakht, L., Esmaillzadeh, A and Azizi, F. (2004). **Dietary diversity score in adolescents—a good indicator of the nutritional adequacy of diets: Tehran lipid and glucose study.** Asia Pac J Clin Nutr No. 13. Pp 56–60.

Onyango, A. W. (2003). **Dietary diversity, child nutrition and health in contemporary African communities**. Comp Biochem Physiol A Mol Integr Physiol No. 136. Pp 61–69.

Onyango, A., Koski, K. G and Tucker, K. L. (1998). **Food diversity versus breastfeeding choice in determining anthropometric status in rural Kenyan toddlers.** Int. J. Epidemiol No 27. Pp 484–489.

Ruel, M. T. (2002). **Is dietary diversity an indicator of food security or dietary quality? A review of measurement issues and research needs.** FCND Discussion Paper 140. Washington DC.

Swindale, A and Bilinsky P. (2006). **Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide (v.2).** Food and Nutrition Technical Assistance Project, Academy for Educational Development. Washington, D.C. USA. Pp 1-13.

Tarini, A., Bakari, S and Delisle, H. (1999): **The overall nutritional quality of the diet is reflected in the growth of Nigerian children.** Sante No. 9. Pp: 23–31.

CHAPTER 7

7.1 General discussion

7.1.1 Socio-demographic characteristics

Data in the current study indicates there are more persons under 30 years with those below 20 years accounting for more than half of the population. This data is consistent with the 2008 KDHS. In the KDHS report, for both sexes, there are more persons in the younger age groups than in the older age groups. Those aged 0-18 years account for more than half of the population (KNBS and ICF Macro, 2010). Those aged 60 years and above make up 2.31% of the total population surveyed. The age dependency ratio is 0.88. According to the KDHS 2008, those age 65 years and older make up about 4% of the total Kenyan household population. The age dependency ratio in Kenya increased slightly, from 0.92 in 2003 to 0.96 in 2008 (KNBS and ICF Macro, 2010).

The findings of the current study contradict one of the aims of school feeding and most commonly cited benefit which is to increase school attendance and enrolment (Allen, 2001 and Levinger, 1986). This study found that the enrolment in the SMP school increased as both children and parents were drawn by the school meal but attendance declined. These results further disagree with the WFP, whose research and experience has shown when food is provided at school, hunger is immediately alleviated, and school attendance often doubles within one year (WFP, 2005).

7.1.2 Nutrition status

Comparing the children's nutritional status using t test revealed that there were no significant differences in the two groups. The moderately malnourished children (BMI for Age), were equally divided between the schools but there were more moderately malnourished male children than female. This may be explained by the onset of puberty and hence growth spurts which occur at around the age of 10-11years for girls and 12-13years for boys. During this period, there are increased nutrient needs which if not catered for may lead to deficiencies therefore causing malnutrition.

7.1.3 School feeding

School meals make a significant and positive contribution towards reducing pupils' hunger and improving nutritional intake. The mean intake of the food provided to the children by the WFP failed to fulfil its estimated nutrient provisions of 703.25 calories, 13.5 grams of protein as elaborated by Lambers (2009). When the full school was in session, children obtained lower amounts of nutrients especially from energy and protein. A key informant interview with a WFP representative revealed that nutrition was not a factor considered in the selection of the school feeding items. He explained that the organization had no specific way of knowing whether the school meal program (SMP) was improving the targeted children's nutrition status. He further explained that the foods to be used in the SMP's are not selected by WFP but are dependent on what is received from donors.

7.1.4 Contribution of school meal to RDA and dietary diversity

When it came to RDA, the school meal contributed more during the holiday tuition, than when the full school was in session. Of all the nutrients, the meal contributed the most to the RDA of Vitamin A. This was a significant contribution considering the deficiency of this vitamin in these children's diet. Energy and protein came close to providing half of RDA during the holiday tuition session. These results indicate that the children who came for holiday tuition stood a better chance of having improved nutrition from the school meal than when all the children were back in school. The school meal contribution also indicates that in spite of the children in the SMP having to pay for the meal, they are at a better position compared to their counterparts in the Non SMP school. Their home diet is improved and supplemented by the school meal.

The school meal's contribution to dietary diversity was very minimal. In total, the school lunch fulfilled three food groups; the legume group, cereals and oils & fats. Considering the children's diet was already high in cereals, oils and fats, the contribution from the school meal was in only one food group: the legume group. This was nonetheless a significant contribution because the children were consuming very few foods if any, from this group. It placed the children in the SMP school at a slight advantage compared to their Non SMP counterparts when it came to dietary diversity.

7.1.5 Nutrient adequacy

Majority of children were able to meet their iron RDA because they were consuming a lot of iron rich foods in their diet. The children's diet was low in fruits and vitamin A rich vegetables and tubers and preformed vitamin A such as eggs, milk and liver. This could be the reason they were not meeting their vitamin A RDA. Even though most of the salt in Mombasa County is iodized, it is possible that the households interviewed may have been lying about using iodized salt hence explaining why the children were unable to meet their iodine RDA. Their method of storing the salt might also have played a part as many respondents were not aware of the volatile nature of the mineral.

The children may not have been able to meet their iron RDA's completely because of bioavailability. Zinc, niacin, iron, and provitamin A carotenoids are nutrients with well-known issues of bioavailability. The distribution of nutrient intakes also may be inaccurate if bioavailability varies within the population but is not considered when nutrient intake is estimated for each individual.

7.2 General conclusions

With reference to the results of this study, the following conclusions can be made:

1. The socio-demographic characteristics of households in both areas studied were comparable. However, the SMP school had households with better incomes and sanitation facilities.
2. The WFP objective of keeping children in school through school meals is being undermined by the feeding fees the children have to pay which end up keeping them children away from school.
3. There were no factors significantly contributing to the nutritional status of children in this study.
4. There were no significant differences in the dietary patterns of children from both schools. The children's diet was poor in Vitamin A and iodine.
5. The school meal was found significantly able to contribute to meeting the children's vitamin A RDA.
6. The school meal contribution to the children's dietary diversity was one extra food group which placed them at an advantage compared to their Non SMP counterparts.

The findings of this study imply that the WFP school meal program within Kisauni District was contributing to the children's RDA in an area they were lacking; vitamin A. The meal served was able to improve the children's dietary diversity and hence overall diet. The school meal contribution also indicates that in spite of the children in the SMP having to pay for the meal, they are at a better position compared to their counterparts in the Non SMP school. Their home diet is improved and supplemented by the school meal.

7.3 General recommendations

In view of the findings of this study, the following recommendations are made: in order to improve the contribution of school lunch among primary school children;

1. The school committee in charge of the feeding program ought to consider reducing or scraping of the fees on feeding especially for children whose parents/caretakers cannot afford to pay. If not so, there should be a provision where such children are catered for and do not have to pay.
2. WFP needs to take into account the nutrition component while designing their meal programs. This would go a long way in improving the nutritional status of the children being targeted.
3. There is need for the SMP school to come up with a standardised way of serving food portions to the children if they are to meet the energy and nutrient requirements they are supposed to.
4. Better indicators for measurement of nutritional status need to be identified to provide more accurate information especially for adolescents. This is because BMI does not attest to the difference between fat tissue and lean mass among them.
5. The community ought to supplement the school meal by providing fruits and vegetables where possible to improve the school meal and improve nutrient adequacy more.
6. Before implementation of the program, WFP ought to investigate the children's situation at home to ensure that the food they are receiving at school does not end up being shared by the whole family with the targeted child not benefiting. This is because some of the children carry their share of food home.

REFERENCES

ACC/SCN. (1998). **Nutrition of the School Aged Child**. SCN News No. 16. Pp: 3-20.

ACC/SCN. (2002). **School age children their health and nutrition.** SCN News No. 25. Pp: 4 -30.

Anderson, P. M and Butcher, K. F. (2006). **"Reading, Writing, and Refreshments: Are School Finances Contributing to Children's Obesity?** J Human Resources No.41. Pp: 467-494.

Belot, M and James, J. (2009). **Healthy School Meals and Educational Outcomes.** ISER Working Paper Series, Institute for Social & Economic Research, Essex, UK. Pp: 2- 17.

Brown, K. H., Peerson, J. M., Rivera, J and Allen, L. H. (2002). **Effect of supplemental zinc on the growth and serum zinc concentrations of prepubertal children: a meta-analysis of randomized controlled trials.** Am J Clin Nutr 75. Pp: 1062–1071.

Buhl, A. (2010). **Meeting Nutritional Needs Through School Feeding: A Snapshot of Four African Nations.** Global Child Nutrition Foundation; University of Washington, School of Public Health.

Bundy, D., Burbano, C., Grosh, M., Gelli, A., Jukes, M and Drake, L. (2009). **Rethinking School Feeding: Social Safety Nets, Child Development and the Education Sector.** Washington DC.

Bundy, D. A. P., Shaeffer, S and Jukes M. (2006). **School–Based Health and Nutrition Programs.** Disease Control Priorities in Developing Countries (2nd Ed), New York: Pp: 1091-1108.

Cataldo, B. C., DeBruyne, K. L and Whitney, N. L. (2003). **Nutrition and Diet therapy; principles and practice.** 6th Ed. Wardsworth, a division of Thomson learning incorporated. Kendallville, USA. Pp: 182-189.

Cavan, K. R., Gibson, R. S., Grazioso, C. F., Isalgue, A. M., Ruz, M and Solomons, N. W. (1993). **Growth and body composition of periurban Guatemalan children in relation to zinc status: a cross-sectional study.** Am J Clin Nutr No. 57. Pp: 334–343.

Centres for Disease Control (CDC). (1996). **Guidelines for School Health Programs to Promote Lifelong Healthy Eating.** Accessed on 29th April 2010 at www.cdc.gov/mmwr/preview/mmwrhtml/00042446.htm. Pp: 3 -12.

Chittang, U. (2010). **Technical Support for School Lunch Quality Improvement: Thailand Experiences.** Accessed on 11th May 2010 from www.unescobkk.org/fileadmin/user_upload/apeid/Conference/.../3F3.pdf. Pp: 1- 4.

De Onis. M., Monteiro. C and Clugston, G. (1993). **The worldwide magnitude of protein-energy malnutrition: an overview from the WHO Global Database on Child Growth.** Bulleting of the WHO No. 71(6). Pp: 1 -12.

Dietary Guidelines Advisory Committee (2000). **Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans.** Department of Agriculture, Agriculture Research Service. Washington, DC: U.S. accessed at http://www.health.gov/dietaryguidelines/dga2005/Backgrounder.htm on 12 may 2010. Pp: 1 – 5.

Galloway, R., Kristjansson, E., Gelli, A., Meir, U., Espejo, F and Bundy, D. (2009). **School feeding: outcomes and costs.** Food Nutr Bull No. 30(2). Pp: 171-181.

Gibson, R. (2005). **Principles of Nutritional assessment.** 2nd edition. Oxford University press, New York.

Global Child Nutrition Foundation (GCNF) (2010). **School Feeding In Uganda Report for the Global Child Nutrition Forum 13th – 19th July 2006.** Accessed at http://www.gcnf.org/library/country-reports/uganda/2006-Uganda-School-Feeding.pdf on 4th Sep 2010. Pp: 1-2.

Government of India (GoI): National Portal Content Management Team. (2010). **Mid-Day Meal Scheme.** Accessed at http://india.gov.in/sectors/education/mid_day_meal.php on May 17 2010

Grantham-McGregor, S. G. (1995). **A review of studies of the effect of severe malnutrition on mental development.** J. Nutr No.125. Pp: 2233S–2238S.

Growth, S. M. (1973). **Nutritional Assessment of Adolescents.** *Amer J P. Health SUPPLEMENT* No. 63 (11 Suppl). Pp: 53–56.

Gulliford, M. C., Mahabir, D., Rocke, B., Chinn, S and Rona R. J. (2006). **Free school meals and children's social and nutritional status in Trinidad and Tobago.** P Health Nutr No. 5. Pp: 625-630.

Gustasfon, D. (2008). Food and Agricultural Organization. **Connecting School Feeding Programs with Local Agricultural Development: Indian Examples and Challenges.** Global Child Nutrition Foundation Forum cited in Winch, Rachel. and Leland, Mickey. (2009). **International Approaches to School Feeding: Country Experiences from Mali, Chile, and India.** International Hunger Fellow Global Child Nutrition Foundation accessed on 17th May 2010. At www.hungercenter.org/international/International_Approaches_to_School_Feeding. Pp: 5 – 28.

Hall, A., Drake, L. J and Bundy, D.A. P. (2001). **Public Health Measures to Control Helminth Infections.** In Nutritional Anemias, ed. U. Ramakrishnan. Boca Raton, FL: CRC Press.

Hambidge, K. M. (2000). **Human zinc deficiency.** J Nutr No. 130, Pp: 1344S–1349S.

Kazianga, H., De Walque, D and Alderman, H. (2008). **Educational and health impact of two school feeding schemes: Evidence of a randomized trial in rural Burkina Faso.** Working Paper, World Bank, Washington, DC. Pp: 2 – 19.

Kennedy, G., Nantel, G and Shetty, P. (2003). **The Scourge of "Hidden Hunger": Global Dimensions of Micronutrient Deficiencies.** Food, Nutr and Agriculture No. 32. Pp: 8-16.

Kenya National Bureau of Statistics (KNBS) and ICF Macro. (2010). **Kenya Demographic and Health Survey 2008-09.** Calverton, Maryland: KNBS and ICF Macro.

Kinoti, A. (2009). **Introduction of the school feeding program by the World Food Program.** Mombasa municipal education office unpublished report

Kristjansson, B., Petticrew, M., MacDonald, B., Krasevec, J., Janzen, L., Greenhalgh, T., Wells, G.A., MacGowan, J., Farmer, A.P., Shea, B., Mayhew, A., Tugwell, P and Welch V. (2007). **School feeding for improving the physical and psychosocial health of disadvantaged pupils.** Cochrane Database of Systematic Reviews. Pp: 2 – 29.

Lambers, W. (2009a). **Ending Child Hunger: School Feeding in Nepal.** Accessed at http://www.americanchronicle.com/articles/view/94102 on 12th May 2010.

Lambers, W. (2009b). **Fighting hunger in Kenya with school meals.** Accessed on 1st July 2010 at http://www.examiner.com/global-hunger-in-national/fighting-hunger-kenya-with-school-meals.

Lichtin, E. A. (2008). **Iron Deficiency Anemia.** Merck manuals online medical library. Retrieved from http://www.merckmanuals.com/professional/print/sec11/ch130/ch130b.html on 26 Nov 2010.

Matsoai, M. (2005). **Dietary diversity in relation to nutrient adequacy and nutritional status of primary school children in rural Vietnam.** Msc Thesis. Wagenigen University. Netherlands.

Musamali, B., Walingo, M. K. and Mbagaya, G. M. B. (2007). **Impact of school lunch programmes on nutritional status of children in vihiga District, western Kenya.** *AJFAND* 7(6). Pp: 7 – 9.

Qin. Y., Melse-Boonstra, A., Zhao, J., Wu, M., Hu, X and Kok, F. J. (2009). **Stunting and zinc deficiency among primary school children in rural areas with low soil zinc concentrations in Jiangsu Province, China.** Asia Pac J Clin Nutr No. 18(1). Pp: 15-21.

Umeta, M., West, C. E., Haidar, J., Deurenberg, P and Hauvast, J. G. A. J. (2002) **Zinc supplementation and stunted infants in Ethiopia: a randomized controlled trial**. Lancet 355. Pp: 2021–2026.

US Institute of Medicine (IOM) and Food and Nutrition Board. (2001). **Dietary reference intakes for vitamin A, vitamin K, arsenic, boron, chromium, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc.** Washington, D. C.: National Academy Press.

U.S.D.A. (2007). **National School Lunch Program: Fact sheet.** Retrieved on May 2010, from http://www.fns.usda.gov/cnd/lunch/aboutlunch/NSLPFactSheet.pdf. Pp: 1- 3.

Virtual medical center. (2010). **Nutrition for School Children** accessed at http://www.virtualmedicalcentre.com/healthandlifestyle.asp?sid=89 on May 20th 2010. Pp: 1- 6.

West, K. P., Caballero, B and Black, R. E. (2006). **Chapter 5: Nutrition.** International public health: Diseases, programs, systems, and policies (2nd Edition), Sudbury, MA: Jones & Bartlett Publishers. Pp: 187 – 239.

WFP. (2010). **Hunger.** Accessed on 26 June 2010 at http://www.wfp.org/hunger/faqs.

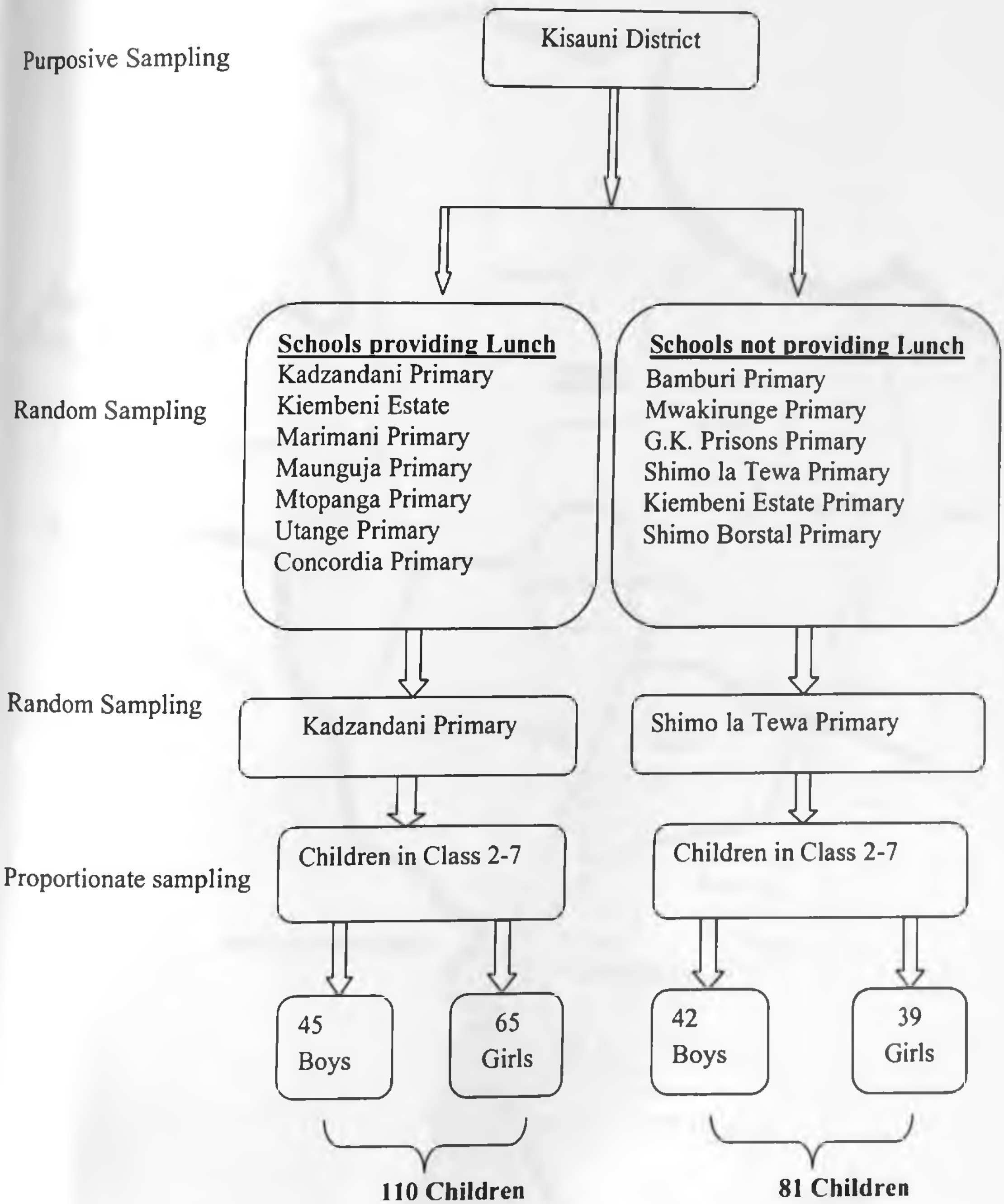
WFP (Office of evaluation). (2010a). **Impact Evaluation of WFP School Feeding Programmes in Kenya (1999-2008): A Mixed-Methods Approach.** Full evaluation report. Vol 1. Accessed at http://home.wfp.org/stellent/groups/public/documents/communications/wfp220182 on 26th August 2010

WFP (Office of evaluation). (2010b). **Impact Evaluation of WFP School Feeding Programmes in Kenya (1999-2008): A Mixed-Methods Approach.** Evaluation brief. Vol Accessed on 19th March, 2011 at http://home.wfp.org/stellent/groups/public/documents/reports/wfp230095.pdf

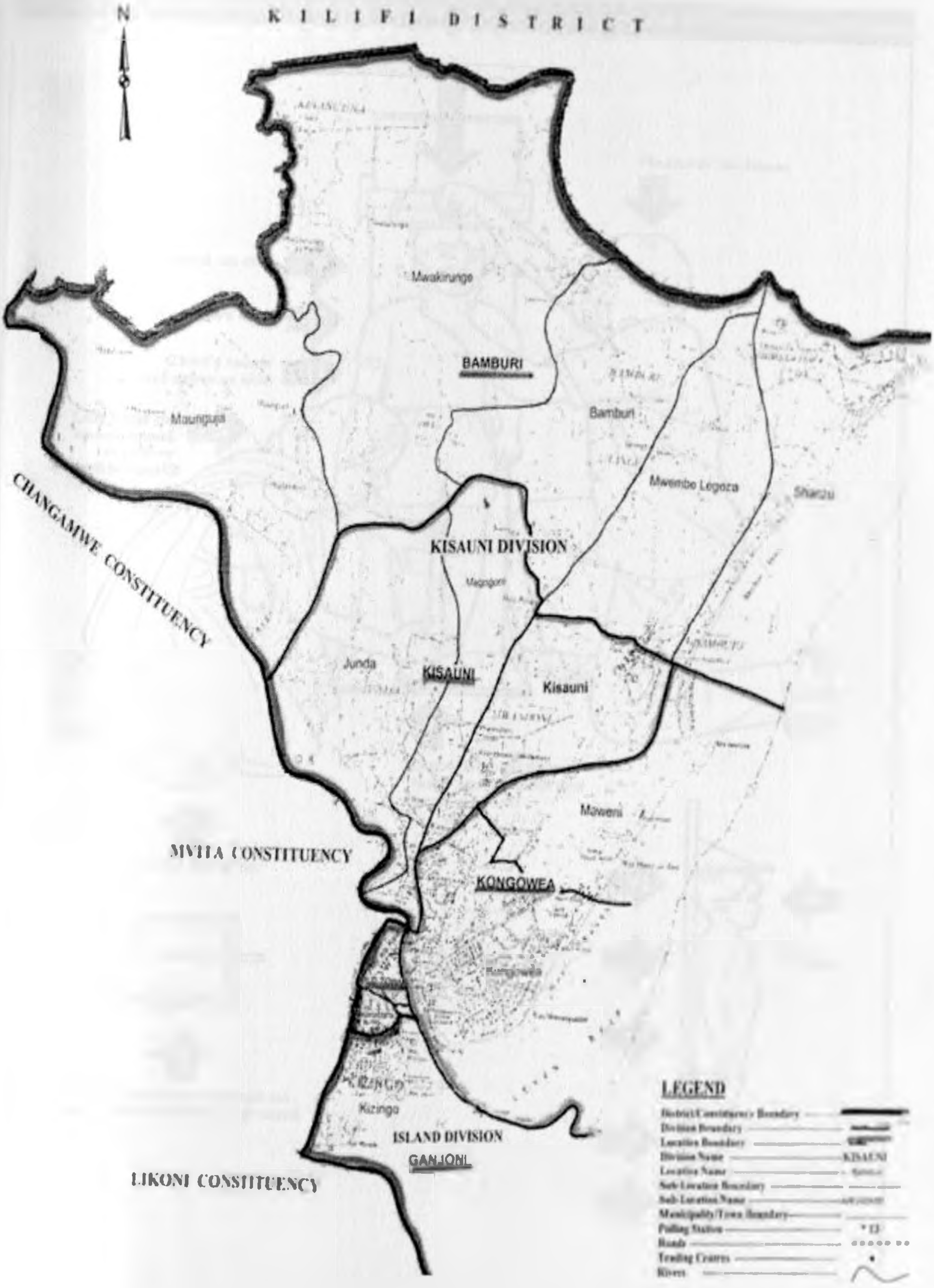
WHO. (1995). **Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee.** Geneva, World Health Organization (Technical Report Series No. 854).

LIST OF APPENDICES

Appendix I: Sampling schema for the schools

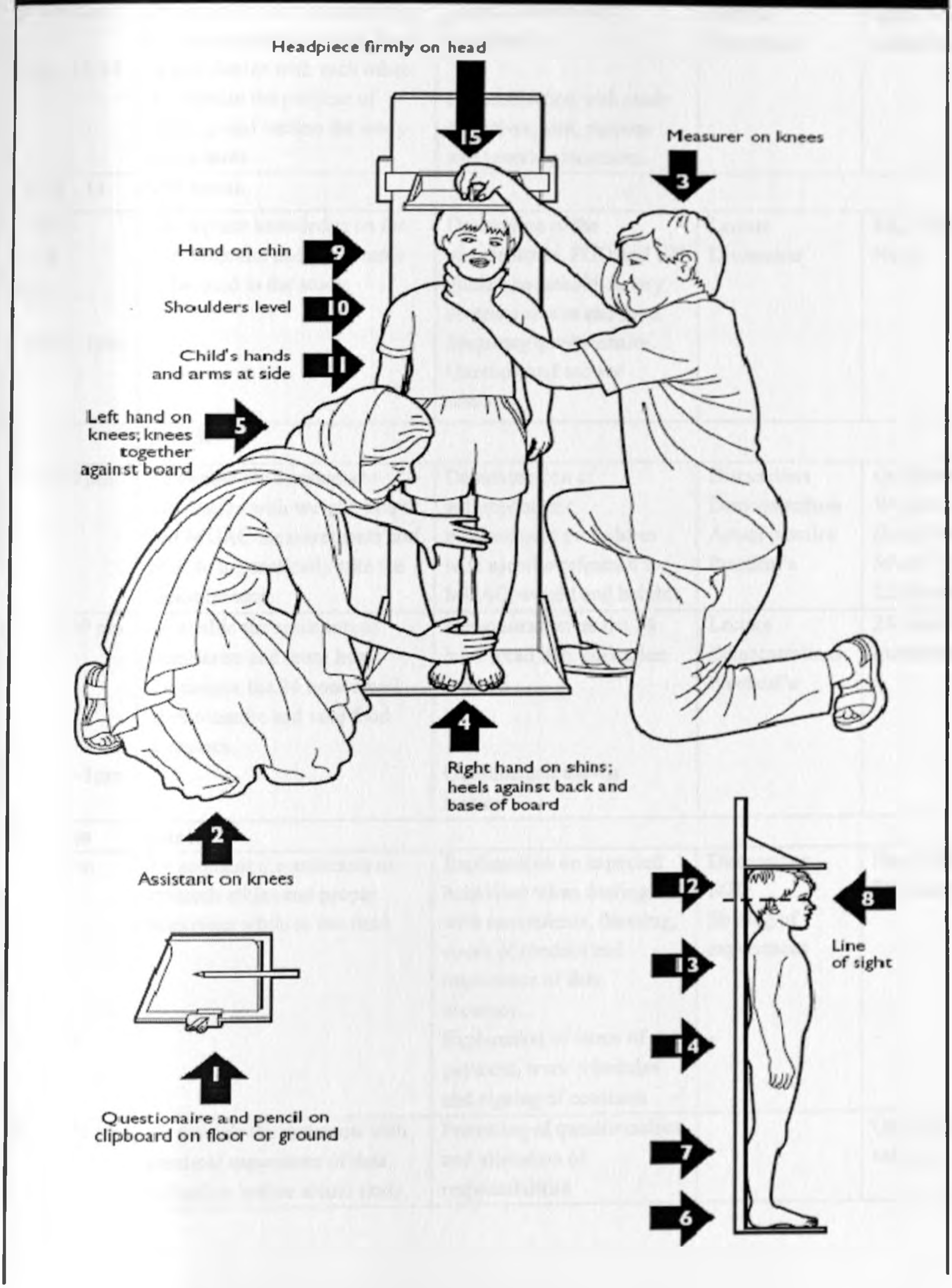


Appendix II: Site map of Kisauni



Appendix III: Correct height measurement

Figure 5.1. Child Height Measurement - Height for Children 24 Months and Older



Appendix IV: Field assistants training schedule

Day	Time	Objectives	Activity	Method	Teaching Aids
1	9 – 9.30 am 9.30 - 10.30	To introduce the researcher to the study assistants, help them to familiarize with each other. To explain the purpose of training and outline the study procedures.	Climate setting and introduction Familiarization with study objectives, aim, purpose and general procedures.	Lecture Discussion	Hand outs and pamphlets
	10.30 – 11	**Tea break**			
1	11am – 12.45 pm 12.45 – 1pm	To implant knowledge on the questionnaire and other tools to be used in the study.	Description of the questionnaire, FGD and KII guides, household dietary diversity scores and food frequency questionnaire. Question and answer session	Lecture Discussion	Flip charts Notes
	1 – 2	**Lunch**			
1	2 - 4.30 pm	To enable the assistants to familiarize with weight, height and MUAC measurements and be able to practically take the measurements.	Demonstration of anthropometric measurement procedures with specific reference to MUAC, weight and height.	Discussions Demonstrations Actual practice Practical's	Questionnaires Weight scales Height board MUAC Tapes Clinic cards
	9 - 12.30 pm 12.35 – 1pm	To enable the assistants to familiarise and learn how administer the 24 hour recall questionnaire and take food measures.	Demonstration on the 24 hour recall data collection method Question and answer session	Lecture Demonstrations Practical's	24 hour recall questionnaire
	1 – 2 pm	**Lunch**			
	2. – 3 pm 3 - 4.30	To acquaint the assistants on research ethics and proper behaviour while in the field.	Explanations on expected behaviour when dealing with respondents, dressing, codes of conduct and importance of data accuracy. Explanation of terms of payment, work schedules and signing of contracts	Discussions FGD Sharing of experiences -	Hand outs Flip charts -
	8 - 12.30 pm	To provide the assistants with practical experience of data collection before actual study.	Pretesting of questionnaires and allocation of responsibilities		Questionnaire samples

Appendix V: Questionnaire

QUESTIONNAIRE

INFORMED CONSENT AND COVER PAGE

Hello. My name is____ I am conducting a survey on the feeding of school children in this area as part of a requirement to graduate from the University. Your household has been selected by chance from all households in the area.

I would like to ask you some questions related to the life and nutritional status of your child. Participation in this survey is voluntary and you can choose not to take part. There will be no injections, drawing of blood or any body fluids involved.

All the information you give will be confidential and will be used for assessment in my thesis. No specific names will be included and there will be no way to identify you as the one who gave information.

If you have any questions about the survey, feel free to ask me. Do you mind if we proceed?

Respondent agreed to be interviewed: **Circle one.**

1. YES **2.** NO

Name of interviewer______________________________

Signature of Interviewer:__________________________

Date of Interview:________________________________

Questionnaire Number____________

SECTION 1: IDENTIFICATION

1. Date of Interview: _____ /_______ /2010 2. Household Number___________

3. Residence______________________________ 4. Division________________________

5. Location________________________________ 6. Class___________________

7. Name of the school child ____

8. Sex of child: (Circle one) 1. Male 2. Female

9. Date of birth of child ___/__ /____ 10. Age of child________________________

11. Name of school____________________________

SECTION 2: RESPONDENT INFORMATION

12 a). Respondent's name__________________b) Age: _______ c) Age of spouse_________

d). Level of schooling attained_________________ e). Relationship to child ______________

1. Father 2. Mother 3. Sister 4. Brother 5. Grandfather 6. Grandmother 7. Aunt 8.Uncle

13. Sex: **(Circle One)** 1. Male 2. Female

14. Marital status of the child's parents **(circle one)**
1=Single 2=Monogamously married 3=Polygamous married
4=Widowed 5=Separated/Divorced 6=Other (Specify)______________

SECTION 3: SOCIO ECONOMIC STATUS

15. How many people are there in your household that you have cooked for and eaten together with in the last 1**month?** ________________

16. What are the sources of income for the household? Of the sources, please rank from the one that gives you the highest to the lowest amount of money. Tick appropriately and rank.

	Income source	**Tick appropriately**	**Rank**
1	Sale of food crops grown		
2	Sale of animals or their products		
3	Casual employment/Labour		
4	Permanent employment		
5	Given by child/children		
6	Business (self employment)		
7	Others (specify)		

SECTION 4: DEMOGRAPHIC CHARACTERISTICS OF THE CHILD'S HH

Q17.

S/No	Name	Relationship to HH head -codes-	Sex M=1 F=2	Age (years)	Marital status -codes-	Religion -codes-	Education -codes-	Occupation -codes-
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

RHHH	Marital Status	Religion	Education	Occupation
1=HHH 2=spouse or wife 3=son 4=daughter 5=grandson 6=grand daughter 7=relative 8=parent 9=house girl 10=Gardener 11=Grand Mother 12=Grand Father	1=married 2=separated 3=widowed 4=single 5=divorced 6=Not applicable	1=Christian 2=Muslim 3=Traditionist 4=others (specify	1=college/university 2=completed secondary 3=completed primary 4=Dropped from primary 5=in primary 6=in secondary 7= adult education 8=illiterate 9= N/A(preschool) 10.=Dropped from secondary	1=salaried employee[1] 2=farmer 3=self employment/business 4=casual labourer 5=pupil 6=housewife 7 = unemployed[2] 8= N/A[3](Preschool) 9=farmer/housewife

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[1] For both adults and for children above 10 years who are employed

[2] Anyone above 18 years and not in college or employed

[3] For preschoolers elderly and aged 5 to 17.9 years neither in school nor employed

18. What is your source of drinking water? (Circle One)

1. Tap water **2.** Water pump (outside)**3.** Protected well **4.** Rain water
5. Pond/ lake **6.** River/stream **6.** Other ______________________

19. What is your house's roofing material? (Circle One)

1. Concrete **2.** Roofing tiles **3.** Grass thatched roof
4. Iron sheet **5.** Wood **6.** Other______________________

20. Does your household have any of the following items: (Circle Yes or No)

1. Radio	1 = Yes	2 = No
2. Mobile phone	1 = Yes	2 = No
3. Bicycle	1 = Yes	2 = No
4. Sofa set	1 = Yes	2 = No
5. Water tank	1 = Yes	2 = No
6. Television	1 = Yes	2 = No

21. Does your house hold have a toilet **1.** Yes **2.** No

If yes what type: **1.** Flush toilet **2.** Pit latrine **3.** Free range **4.** Handmade shed pit

5. Other ______________________

22 (a). Do you have a piece of land? 1=Yes 2=No

(**b**). If Yes, how did you acquire it? **1.** Buying **2.** Inheritance **3.** Leasing **4.** N/A

(**c**). How big is your piece of land? ______________________

23 (a) Has any of your children been sent away from school this term? 1. Yes 2. No

(**b**). If yes, what was the reason? **Tick appropriately.**

I. Lack of school fees ________
II. Lack of text books ________
III. Lack of school uniform ________
IV. Broke school rules ________
V. Other reason ______________________

24. How much does your family earn in **a month**?

1: <5000/= **2:** 5000 - 15,000/= **3:** 15,000 – 25000/= **4:** >25000/=

SECTION 5: CHILD DIETARY DIVERSITY

25. How many meals has the child had from this time yesterday to now? ____________

26. What food groups did your household consume in the past 24 hours (from this time yesterday to now)? Include any snacks consumed.	Did the child consume food from these food groups in the last 24 hrs?
Type of food	*1=Yes* *2= No*
Grains, roots and tubers	
Milk and milk products	
Vitamin A rich plant foods *(e.g. green or leafy vegetables, carrots)?*	
Other fruits and vegetables	
Legumes, nuts *(e.g. beans, green grams, cowpeas; peanut)*?	
Meat, poultry, fish and sea food	
Foods cooked in oils or fats *?*	
Eggs?	

27. Total number of food groups consumed by the child: ____________

FOOD FREQUENCY

28. What foods does your family eat and how frequently are those foods eaten?

Foods	Examples	Frequency per Week		
		1=Rarely consumed	2=2-3 Times a week	3=4-6 Times a week
Cereals and products	maize, ugali, spaghetti, rice, bread, porridge			
Milk and milk products				
Sugar & honey				
Oils/fats	cooking fat or oil, coconut milk, margarine			
Meat, poultry & products				
Legumes, nuts	beans, green grams, cowpeas; peanut			
Roots & tubers	Irish/sweet potatoes, , cassava			
Vegetables	Leafy vegetables, tomatoes, carrots, onions			
Fruits	mangoes, oranges, bananas,			
Eggs				
Fish & sea food				

SECTION 6: Q29 – Q37 MORBIDITY FOR CHILDREN

29 a) Has the child experienced or shown any sign of illness within the last 2 weeks?

1= Yes 2= No **If no, skip to Question 37**

29 b) If yes, is the treatment card available? 1= Yes 2= No

30. Diarrhoea in the last 2 weeks? 1= Yes 2= No

31. Serious Acute respiratory Illness in the past 2 weeks? 1= Yes 2= No

32. Suspected Malaria in the past two weeks? 1= Yes 2= No

33. Anaemia in the last two weeks? 1= Yes 2= No

34. Any other illnesses? Specify ______________________________

35. Do you have a mosquito net? 1= Yes 2= No

36. Did the child sleep under a mosquito net last night? 1= Yes 2= No

37 a). When the child was sick, did you seek medical care? 1= Yes 2= No

37 b). Where did you seek medical care when the child was sick?

1= Own medication 2= Traditional healer 3= Private clinic/pharmacy
4= Public health facility 6= Other: Specify______________________________

38: Are the children given Vitamin A capsules at school? 1. Yes 2. No

b): Does every child receive? 1. Yes 2. No

c): How many times have they been given this term? ______________

39: Has the child been dewormed in the last six months? 1= Yes 2=No

40 a). Do you use salt? 1= Yes 2=No

b) If yes, what is the source? 1= supermarket 2= open air market 3= kiosk
4 = ocean 5= others__________

c) What is the brand name? ______________________________

d) How do you store your salt? 1= open container 2= closed container

41 a): How did the child perform in the last exams? ____________________

1. 100-199 Marks 2. 200-299 Marks 3. 300-399 Marks 4. 400-500 Marks

b) How would you compare this performance with previous ones?
1) Decreasing 2) Stable 3) Improving

c)How would you gauge the overall performance?
1) Poor 2) Fair 3) Good 4) Excellent

d) In the school term just ended, has your child missed school? 1) Yes 2) No

If yes, what was the reason? ______________________________

SECTION 7: SCHOOL FEEDING

42 a): Do you know what your child eats at school? (Circle one) 1. Yes 2. No

b) Do you think it is adequate? (Circle one) 1. Yes 2. No

c) If no, what do you do to supplement it?____

____

d) Do you feel the school feeding program can be improved? 1 Yes 2 No

In what ways?

____

____

SECTION 8: ANTHROPOMETRY

Q 43- Q49 ANTHROPOMETRY MEASUREMENTS

Childs Name: ______________________________

Q. 43 Child Birth Order	Q. 44 Sex	Q45 Date of birth	Q. 46 Age		Q. 47 Weight ±0.1 kg		Q. 48 Height ±0.1 cm		Q.49 MUAC ±0.1 cm	
	1=M 2=F	*(Verify from document)*	Yrs	Mths	1st	2nd	1st	2nd	1st	2nd

Appendix VI: 24 hour recall questionnaire

24 HOUR RECALL QUESTIONNAIRE

Name of Child: ____

Age:____________________

School____

Class____________________

Date of Interview____________________________

24 HOUR RECALL

Twenty four-hour recall for food consumption in the households: The interviewer should establish whether the previous day and night was usual or normal for the households. If unusual- feasts, funerals or most members absent, then another day should be selected.

a). Starting from morning, what did your family eat the whole of yesterday?

b). What was the amount of dish cooked?

c). What were the raw ingredients used in the dish and amounts?

d). What amount was left over?

Note: if food remained after a meal, it is important to be shown the amount (volume) which should then be indicated under "amount left over" column.

Time	Name of Dish	Name of ingredients in Dish	Amount of ingredients used in Preparation	Total amount of cooked dish	Total amount served to the child	Amount child left	Amount consumed By child
Break fast							
Lunch							
Supper							
Total							

Appendix VII: Food samples used in the 24hr recalls

Food item	Size	Price	Weight
Sukuma (cut)	-	10/=	208.75g
Potatoes	Large		120g
	Medium		80g
	Small		60g
Onions	Large	5/=	50g
	Medium	3/=	30g
	Small	2/=	20g
Tomatoes	Large		100g each
	Medium	3 or 4 for 10/=	80g each
	Small	6 for 10/=	70g each
Bread (I slice)	Base		25g
	In slice		20g
Cooked beans		10/=	242.5g
Roasted Maize		5/=	87.5g
Oranges	Small	5/=	120g
	Medium	7/=	320g
Egg Plant	Medium	2 @ 5/=	55g
	Small	6 pieces for 10/=	Each piece 25g
	Large	3 pcs for 10/=	Each piece 50g
		5/= per piece	40g, 25g, 30g
Okra(mabenda)	5 pcs	5/=	40g
		1/= per piece	4pcs 30g
			7pcs 50g
Tunguja	Small		7.5g
	Medium	1/= per piece	15g
	Large		25g
Lemons	Medium	5/= a piece	75g
Bananas	2 for 10/=		127.5g
	3 for 20/=		170g
Mahamri		2.5/=	
		3/=	30-35g
		5/=	50g
Guava	Large	10	100g
Viazi karai		1/=	10-15g
Omena		10/=	25g
		20/=	50g
Gingernut biscuits	3 biscuits	5/=	24g
	4 biscuits	5/=	25g
Chapati		10/=	100g
Maandazi		3/=	20g
		5/=	40g

Kaimati			20g
Cabbage (cut)		20/=	570g
Oil		10/=	70g
		50/=	350g
Cooked sweet potatoes	medium		160g
	small	5/= a piece	122g
Peanuts		5/= a packet	45g
Green gram/ beans samosas		5/= each	20g
Green pepper	Small		22.5g
Dogfish (papa)		10/= per piece	15g
Mangoes	Medium		
Kangumu (halfcake)			
Mhogo (fried cassava)		5/=	50g
Doughnut		5/=	30g
Tomato paste		16/=	70g
Roiko	Satchet	3/=	7g
		5/=	15g
	Cube	2/=	4g

Appendix VIII: FGD question guide

Focus group discussion question guide (teachers and students)

Date____________________Time: __________________

Venue: ____________________

Name of the recorder: ______________________________

Classification of participants____________________________

Number of participants: ______________________________

Guide Line Questions

1. Do you feel it was a good idea to introduce school feeding here? Why?
2. In what ways is it beneficial?
3. Since it started, has school feeding changed the way you view school?
4. What do you think is the criteria of inclusion to the school feeding program?
5. Why do you think some schools provide lunch and others do not?
6. Do you like the food they give you for lunch? Why?
7. What improvements do you feel can be made?
8. Do you feel the quantity given per child is enough?
9. What are your feelings about the feeding fees?
10. What are the appropriate foods to provide in school? Why?
11. In your opinion, who is responsible for the management of school feeding?
12. Do you like the way the school feeding is managed?
13. Are there some children who don't take the school lunch? Why?
14. Who do you think is the sponsor of school feeding in this area?
15. Do you know the preparation procedures and service of the school meal?

Appendix IX: Key informant interview question guide

Kadzandani Primary:

Date: ____________________ Name of the Respondent: ______________________

Title/Position: ______________________________ Organization: ______________________

Recorder ___________________________

1. When did the school feeding officially start in this school?
2. Who manages the feeding program within the school?
3. Is there an eligibility criterion to the school feeding program?
4. How many children participate in the feeding program and what foods are provided within the program?
5. Who prepares the food? How are these people selected?
6. Do you think the food is adequate for the children or it should be improved?
   Do you have children that do not take the lunch daily? What do you do about it?
7. How do you measure the amount of food that is cooked?
8. How is the quantity given to each child estimated?
9. How often do you do reports and to whom?
10. Who delivers the food to the school and when is it replenished?
11. What is the attitude of the children, teachers and parents toward the school feeding?
12. Who does the food distribution when it is cooked?
13. Are there cases when some children miss food? What is done about that?
14. Are the children de-wormed or provided with Vitamin A capsules? At what intervals?
15. How do you cater for children with special needs like HIV, cancer?

KII: WFP:

Date: ______________________________

Name of the Respondent: ______________________________

Title/Position: ____________________________ Organization: ____________________

Recorder ____________________________________

1. What led to the introduction of SMP in Mombasa and when was it officially done?
2. Who is in charge of the overall school feeding in Mombasa?
3. What are the basic requirements for the initiation of an SMP in a school?
4. Who chooses the foods to be used and why?
5. What are the quantities and portions based on?
6. Where do you obtain your supplies from? How are they chosen?
7. Who does the SMP monitoring? How often is this done?
8. Where do you store the food before distribution?
9. Who are your implementing partners? What is the criterion for selecting them?
10. Who does the inspection and monitoring of the SMP? How often is it done?
11. Is nutrition a factor in the selection of the SMP foods?
12. What are the positive and negative effects of SMP?
13. How is the allocation of food supplies to schools done and what is the targeting based on?
14. Does WFP offer any kind of assistance to schools apart from school feeding? On what criteria is this based on?
15. Why is it that most SMP's are concentrated in Kisauni District?
16. Could you please explain the differences in the types of SMP's WFP supports?
17. Are there plans to incorporate more schools in the SMP program in the future?