FACTORS AFFECTING NUTRITIONAL INTERVENTIONS ON MALNOURISHED CHILDREN (6-59 MONTHS), PREGNANT AND LACTATING MOTHERS IN MANDERA EAST AND NORTH DISTRICTS

BY

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DECLARATION

This research project report is my own original work and has not been presented for a degree award in any other University. Any errors and omissions are entirely the author's.

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This research report was submitted for examination with my approval as a University Supervisor.

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DEDICATION

I dedicate this research work to my parents, Mr. William Wasilwa Kopi, Mrs. Rose Beled Wasilwa, brother, sisters and my closest friend Lydia Murugi for their devotion to the pursuance of my education.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASAL	Arid and Semi-Arid Land
CHANIS	Child Health and Nutrition Information System
GAM	Global Acute Malnutrition
H/H	House hold
IDD	Iodine Deficiency Disorders
IMCI	Integrated Management of Childhood Illnesses
MAM	Moderate Acute Malnutrition
MOMS	Ministry of Medical Services
MOPHS	Ministry of Public Health and Sanitation
MUAC	Mid Upper Arm Circumference
MTCT	Mother-To-Child Transmission
OTP	Out-patient Therapeutic Program
PEM	Protein Energy Malnutrition
RUTF	Ready to use therapeutic Food
SAM	Severe Acute Malnutrition
SFP	Supplementary Feeding Programme
UNICEF	United Nations Children Fund
VAD	Vitamin A deficiency
WHO	World Health Organization

ABSTRACT

Malnutrition remains a consistent challenge in the world especially sub-Saharan Africa. Kenya Demographic Health Survey data collected between 1993 and 2008 indicate no significant gain in reduction of malnutrition (GOK, 2009). Although underweight seem to be on the gradual decline, there is no indication that the change in the proportion of children chronically malnourished (stunted) and wasted are on the decline. Mandera East and North districts are among Arid and Semi-Arid Land (ASAL) districts has been experiencing perennial droughts which results to loss of livelihood. The region depends mostly on Relief Aid where there, Global Acute Malnutrition (GAM) levels have remained relatively high (> 15% the WHO threshold standards). The research focused on the three factors namely; effect of health and nutrition education, influence of family economic status and family size nutrition intervention program. Each of these was studied to establish the extent at which it contributes to malnutrition intervention. To achieve this, descriptive survey was employed where from population of 350 beneficiaries, 186 was selected by proportional sampling technique to get sample size from each division; each sample unit was selected through simple random sampling technique. Quantitative data was analyzed through SPSS where and heights of children 6-59 months were analyzed to determine their Z score based on WHO WFH Z score reference while for pregnant and lactating mothers MUAC was used to determine their nutritional status. All other indicators were analyzed by the same software based on their frequencies. The study revealed that family economic status positively influences the nutritional intervention program. On family size, the study found out that the bigger family size the higher the food demand thus higher the malnutrition cases in families with food insecurity. From the study, the following conclusion was drawn; health and nutrition education had a positive effect on the nutritional intervention program, if well done it reduces duration taken for the beneficiaries to cure. Based on the findings, the study recommended that educations programs should be emphasized as a means of community empowerment. Nutritional programs need to be integrated with programs like hygiene and sanitations which involve toilet construction and empowering the community on the importance of maintaining high standards of hygiene and livelihood which has long term impact as opposed to short term projects which emphasize on reliance on Relief Aid thus posing high dependency syndrome.

CHAPTER ONE

INTRODUCTION

1.1Background of the study

Malnutrition constitutes a global "silent emergency," killing millions every year and sapping the long-term economic vitality of nations. It is estimated that more than one-third of under five children are malnourished either stunted, wasted or deficient in vitamin A, iron or other micronutrient and malnutrition accounts to more than a half of the 10.6 million death each year among young children in developing countries. Poor nutrition has been responsible, directly or indirectly, for over 50% of the 10.6 million deaths annually among children under five globally. Two-thirds of these deaths, which are often associated with inappropriate feeding practices, occur during the first year of life. Many suffer long term effects like impaired development, malnutrition, increased infectious & chronic illness. WHO/UNICEF recommends for appropriate feeding of infants and young children (WHO, UNICEF 2006).

The three most important forms of malnutrition worldwide; protein-energy malnutrition (PEM), vitamin A deficiency (VAD) and iodine deficiency disorders (IDD). WHO estimates that malnutrition (underweight) was associated with over half of all child deaths in developing countries in 1995. The United Nations estimates that one out of every three preschoolers in developing countries is malnourished.180 million children under the age of 5 years exhibit at least one manifestation of malnutrition. Improving preschooler health and nutrition are seen to be important development objectives in their own right (World Bank 2002).

In Kenya, the infant and the under-five mortality rates are 77 and 115 per 1000 live births respectively of half has malnutrition as the main underlying cause. The national figure for acute malnutrition of children under five years old is estimated at 6%; however there are huge variations in different regions of the country. In the Arid and Semi Arid Areas (ASAL) where food insecurity and natural disaster have affected the population, rates of acute malnutrition are between 15-40% of children under five, and sometimes substantially higher (National nutritional guideline 2010). UNICEF (2009) estimated that 1 in every 3 children aged 2 years in Kenya are moderately or severely malnourished either by being wasted or stunted. Stunted children grow up to become stunted adults. It is currently estimated that 55% of pregnant women and 48% of non-pregnant women are anemic. Anaemic women are more likely to face reproductive health problems, which can lead to their death and that of their children. Anaemia has far-reaching effects on productivity; and particularly among women who are the main food producers in our country. Scientific research shows that there is at least a 1% drop in productivity for each 1% drop in iron status.

HIV/AIDS and malnutrition are intrinsically linked. Although the prevalence of HIV in the general population reduced from 13.5% in 1999 to 5.9% in 2006, the prevalence among pregnant women is approximately 7.8 %, resulting in an estimated 90,000 children at risk of mother-to-child (MTCT) transmission of HIV. It is estimated that between 33,500 and 65,500 children in Kenya are becoming infected with HIV from their parents each year (Robert E Black et al 2008, World Food Programme 2000).

Mandera East and North districts are among Arid and Semi-Arid Land (ASAL) districts has been experiencing perennial droughts which results to loss of livelihood. The area is known as place where food insecurity is major challenge every year, this worsened in 2005, and the county has been designated as emergency area prompting interventions in health and nutrition among others. The districts are among other ASAL regions that have relied on Relief Aid where the community perceives it as the main `source of livelihood. As a result, Global Acute Malnutrition (GAM) levels have remained relatively high (> 15% the WHO threshold standards) with the recent assessment indicating acute malnutrition rate of 26.9% and 24.7% (Islamic Relief survey may 2011 and March 2010 respectively) in Mandera. As well, performance data from health facilities by Ministry of health such as Child Health and Nutrition Information System (CHANIS) show that the prevalence of underweight children under the age of five is high currently at 31%. While the Kenya Nutrition Bulletin by division of Nutrition of March to may 2011 indicate that GAM rates are 27.5%.

According to UN MDG (2008), to achieve Millennium Development Goals four that aims to reduce Child Mortality by two-thirds, between 1990 and 2015 and Goal 5 to Improve Maternal Health that targets to reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio malnutrition interventions are critical. With infant and the under-five mortality rates of 77 and 115 per 1000 live births respectively, much effort need to be invested to meet the goal. To reduce these unnecessary child deaths, the Government implements the Integrated Management of Childhood Illnesses (IMCI) strategy, which combines better management of childhood illness with nutrition, immunization, maternal health, and other health programs. Effective low cost

interventions available can prevent at least 2/3 of child deaths. Some of these interventions are preventive such as breastfeeding, use of insecticide treated nets, complementary feeding, zinc and vitamin A supplementation, improved delivery procedures, and immunization.

Findings from UNICEF (2004), it is estimated that maternal mortality per 100,000 was 414 in 2003. With interventions which targets the underlying cause of malnutrition which include house hold food security, social and care environment and access to health care and the health environment are critical in reducing maternal mortality thus reducing malnutrition rates.

1.2 Statement of problem

The health and well being of women and children, who are the most vulnerable groups that malnutrition has direct effect on high rates of morbidity and mortality thus timely, adequate and properly planned interventions is crucial for their survival (Fratkin et al. 2004; Nathan et al. 2005). Mandera malnutrition rates stands at very high rates. Based on Nutritional survey by Islamic relief (March 2010), where GAM rates were found to 24.7% and SAM rate of 3.0% while the Kenya Nutrition Bulletin by division of Nutrition of March to May 2011 indicate that GAM rates are 27.5 and survey conducted by Islamic Relief in May 2011 GAM rate was 26.9% ,SAM rate of 5.6%. Kenya Drought Impact & Response Update 13 July 2011 by UN OCHA 26.9% GAM rate and 5.6 % SAM rate, same as results of the survey.

The following are the main causes of malnutrition in Mandera; chronic household food insecurity at the household levels which has impacted negatively to the children growth,

war in Somalia leading to influx of refugees from Somalia to share already scares food in Mandera, Poor hygiene and sanitation practices leading to periodic outbreaks of diarrheal diseases, Poor Infant and Young Child Feeding Practices such as low levels of exclusive breast-feeding for the first six months, introduction of complementary foods before six months of life (giving camel milk at birth as sign of wealth) ,low uptake of family planning services and inadequate complementary feeding of both macro and micro nutrients content, increased poverty index in the region from 64% to 81% [Kenya economic survey 2009] , over reliance on the Somali market and culture

Several partners have been on the ground in response to this but no substantial impact is recorded. These include Medicine Du Mond – (MDM) 1991-1992, Medicine San Frontier (MSF) - Belgium 1992, (MSF)- Spain 1998, Action against Hunger(ACF) -USA 2005-2009 and from 2006 to date Islamic Relief Kenya. A lot of resources have been pumped in the area by various stakeholders applying different strategies, but still no sustainable impact has been recorded. These strategies include giving UNIMIX made up of Corn Soya Blended mixed with oil to supplement a total of 1100 kcal per day for every beneficiary diagnosed moderately acute malnourished, Ready to use therapeutic Food (RUTF) which are high energy food, these include plumpy nuts, BP 100 and high energy biscuits are given to severely acute malnourished children without medical complications depending on their weight as therapeutic foods for treating beneficiaries. Protection ratio is also given in additional, targeting any family with malnourished children to avoid sharing the food made to cure those diagnosed with malnutrition. It is given based on family size at 1100kcal/person/day and the commodities dispensing pulses, cereals and oil which were distributed on a monthly basis. General Food Distribution (GFD) is given

to families believed to be having low economic status and cannot meet their nutritional needs. With all these interventions in place, malnutrition rates still stand beyond WHO threshold levels of GAM rates of 15%.Thus most of the malnourished beneficiaries take long to get cured and after short period the go back to malnourished status sustained malnutrition rates. This has left ASAL area in emergency situations with short term interventions geared towards life saving relief projects other than development projects

Therefore this report answers questions why the malnutrition rates are still high besides many years of interventions applying standards set by WHO and UNICEF as guidelines in management of acute malnutrition of main interest is high rates of non recovery among beneficiaries while others cure on treatment by dose as indicated in the protocol. This has negative impact on the performance of the nutritional program on the ground since WHO standards are that the cure rate should be above 75% of the total admitted beneficiaries in the program as measure of good performance.

1.3 Purpose of the study

The purpose of this research was to analyze factors affecting nutritional interventions on malnourished children (6-59 MONTHS), pregnant and lactating mother enrolled in nutrition intervention program in Mandera East and North Districts.

1.4 Specific objectives

The study analyzed three key objectives which were as indicated

1. To assess effect of health and nutrition education in nutritional intervention program.
2. To evaluate influence of family economic status in nutritional intervention program.
3. To examine effects of family size on nutrition intervention program.

1.5 Research questions

1. To what extent does Health and Nutrition education has on nutritional intervention program?
2. How does family economic status affect nutritional intervention program?
3. To what extent does family size affect nutrition intervention program?

1.6 Significance of study

The millennium development goals four which aims at reducing child mortality and the fifth that aims at improving maternal health are of key importance in the study. Much resource has been invested to meet these goals thus the findings of the study are of utmost importance not only to the players in the nutrition sector but also to the service health and to all sectors at large. Good nutrition enhances health of human beings thus high productivity. The effects of malnutrition remain a big threat to the country and globally in development. Lessons learnt from this study will assist decision makers in various levels to evaluate their malnutrition intervention programs, projects and policies to ensure that best practices are adopted as a result sustainable impact will be realized thus reducing malnutrition levels in prone areas.

The core clients are persons charged with the responsibilities of organizing and training to improving the performance of implementers of nutrition interventions. These persons include all national and provincial health workers from MOH,UN bodies WFP, FOA,UNICEF, UNOCHA, UNHCR, ECHO, Local and international NGOs, extension educators, tutors and consultants from related fields.

1.7 Delimitation of the study

Having Malnutrition interventions on the ground, with ability to access the data from the beneficiaries under rehabilitation, my technical background and experience in nutrition made the study a success.

1.8 Limitation of the study

Identifying beneficiaries enrolled in nutrition intervention program who are children under five years, pregnant and lactating mothers. This was countered by working closely with those implementing nutrition programs where the key players are Ministry of Public Health and Sanitation (MOPHS) and Islamic Relief Kenya in identifying cases already under rehabilitation.

Security threat, the area is very unstable with wars erupting any moment. This was countered by liaising with security focal persons within the community to update me in case of any dangers. A strict operational budget limits the amount of data that can be collected. This was overcome by saving money beforehand to take care of these costs.

1.9 Assumptions of the study

It was assumed that selected sample size is a reflective picture of entire population. The tools for taking anthropometric measurement which include height board, Salter scale, digital scale and MUAC tape will have great validity and reliability in measuring desired indicators. The respondents will answer the questions willingly, correctly and truthfully.

1.10 Definition of significant terms

Beneficiaries: People enrolled in nutrition program, being supported by the Intervention.

Cured: Beneficiary who attains target weight or MUAC within Specified time

Lactating: Mothers breastfeeding

Macronutrients: Protein, fat and carbohydrates are macronutrients that make Up the bulk of a diet and supply the body's energy.

Malnutrition: State when the body does not have enough of the required Nutrients (under- nutrition) or has excess of the required Nutrients (over- nutrition).

Micronutrients: Nutrients required in small quantities by the body, mostly In fruits, Vegetables and supplements.

Non recovery: Beneficiary who does not attains target weight or MUAC within specified time

Nutrition interventions: Programs, projects or policies designed to bring down malnutrition rates to WHO acceptable level.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter seeks to establish what researchers have found out about factors affecting malnutrition interventions. It establishes the gaps that exist in the research topic thus forming the basis of undertaking the study. This chapter looks at literature regarding factors affecting malnutrition intervention program. It has been divided into two sections; theoretical literature and empirical literature. The empirical literature review has been further discussed under the following subtopics; health and nutrition education, family economic status and family size. The next section focuses on conceptual frame work that outlines variable of the study.

2.2 Theoretical literature

2.2.1 The concept of malnutrition

Malnutrition is a state when the body does not have enough of the required nutrients referred to under nutrition or has excess of the required nutrients called over nutrition (UNICEF 2006). While Keller (1993) explains malnutrition as an overall term, encompassing: under nutrition resulting from insufficient food intake, over nutrition caused by excessive food intake, specific nutrient deficiencies and imbalance caused by disproportionate intake.

According to Chen c.c.-h et al (2001) found out that Malnutrition is a frequent and serious problem in the elderly which contributes significantly to morbidity and mortality in the elderly which has never received its due attentions.

Malnutrition can be caused through the following means; First Immediate causes which are due to lack of food intake and disease. Secondly, underlying Causes of Malnutrition. Three major underlying causes of malnutrition include: Inadequate household food security (limited access or availability of food). Limited access to adequate health services and/or inadequate environmental health conditions. And Inadequate social and care environment in the household and local community, especially with regard to women and children. And thirdly basic Causes of Malnutrition. This cause of malnutrition in a community originate at the regional and national level, where strategies and policies that affect the allocation of resources (human, economic, political and cultural) influence what happens at community level. Geographical isolation and lack of access to markets due to poor infrastructure can have a huge negative impact on food security (National Guideline 2009).

The theoretical framework below was developed by UNICEF in 1990 as a summary to the causes of malnutrition.

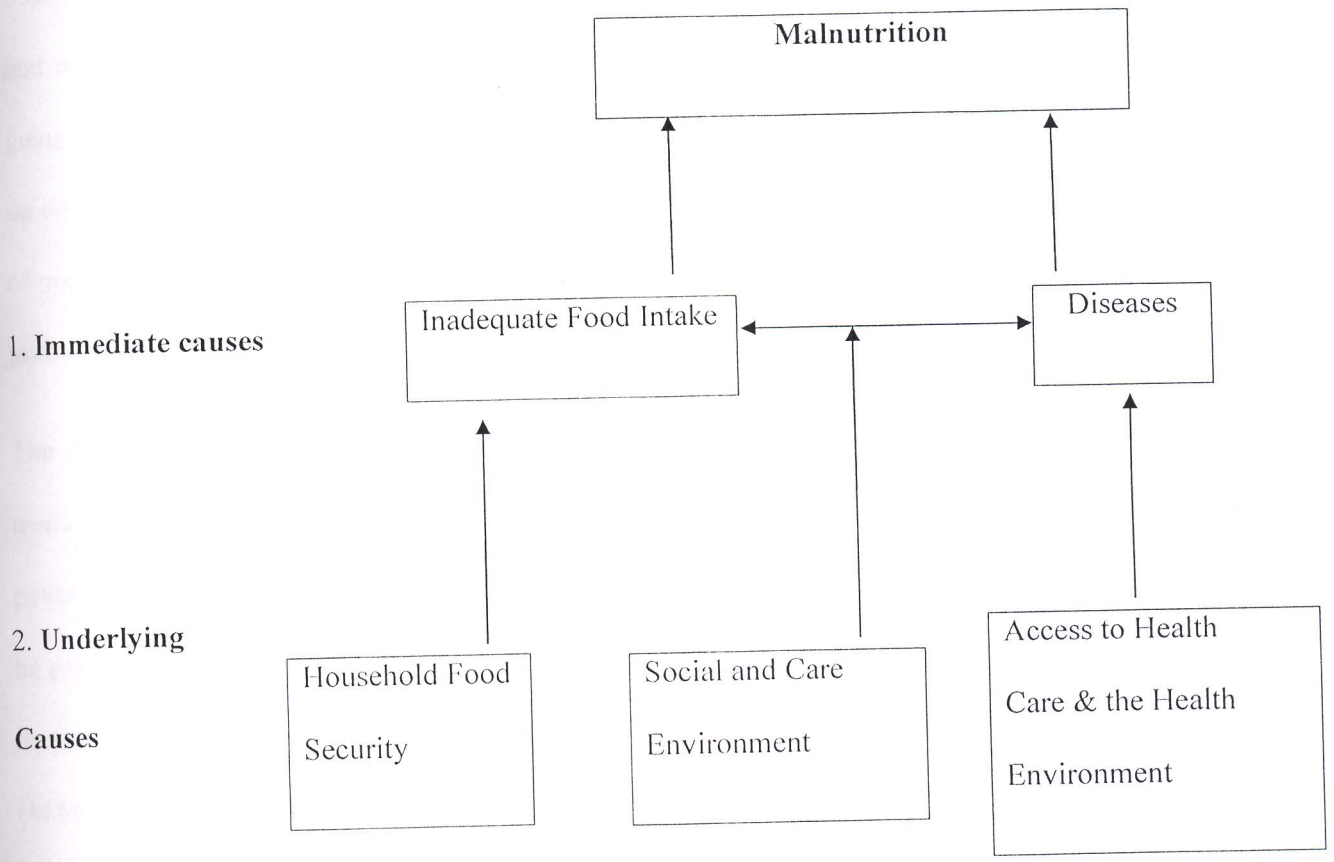

Figure 1: Theoretical Framework

Source, **UNICEF (1990)**

Malnutrition is widespread public health problem in rural areas especially of developing countries. Some of the factors associated with malnutrition are landlessness, general poverty, infections and poor dietary intake. Seasonal fluctuation in food production and household food availability are common in tropical and sub tropical regions of the world and they are reported to complicate malnutrition problem causing to cyclic losses and gains in body weight, and retardation in linear growth. He suggested that for one to come up with an appropriate health and nutrition program, one needs to know the overall extent of malnutrition, which age groups are most affected, and the main proximate causes of a poor diet (Chen et al 1979).

The management of acute malnutrition occupies unique position between clinical medicine and public health, according to Collins et al (2006). The causes are essentially poverty, social exclusion, poor public health, and loss of entitlement and most cases can be prevented by economic development and public-health measures designed to increase dietary quantity and quality alone, with no need for clinical input. Acute malnutrition (MAM) is state where a weight-for-height measurement of negative two SD or more below WHO growth curves, which is called "wasted"; the presence of bilateral pitting oedema of nutritional origin, which is called "oedematous malnutrition. Secondly a mid-upper-arm circumference of less than 125 mm in children age 1–5 years (WHO Child Growth Standard, 2006).

2.3 Empirical Literature

2.3.1 Factors Affecting Nutritional Interventions

Findings by FAO (2002) states that Childhood malnutrition is still a serious global health problem especially in developing countries; its close link to poverty lead to its inclusion as the first goal in the Millennium Development Goals. WHO estimates the fraction of malnourished children in developing countries at 33%, i.e. children that fall below -2 standard deviations. Due to poverty, most of the families especially from malnourished background cannot access quality education resulting to poor health and nutrition education, are limited to religion beliefs which they learn from their mentors because they cannot exposure for themselves due to of limited resources. With such situation, most of these families give birth to many children hoping that one will be solution to their challenges (Mokhtar et al 2001).

Health and Nutrition Education

Nutrition Education being key factor in malnutrition intervention, although it plays fewer roles compared to income. Even if one has an average level of education family with low income, the chances of being malnourished are high. Highly educated mothers, have children who are well nourished the few undernourished may be that of educated mothers who are unmarried. It was concluded that dietary knowledge can go a long way towards protecting children from unfortunate family circumstances. (G.M. Westcott, R.A.P Stott 1977)

The major infectious killers of Kenyan children remain diarrhea, acute respiratory infection, and malaria, although HIV/AIDS is fast becoming a risk for childhood mortality, National Research Council (1993); Omondi-Odhiambo (1984); UNICE(2004). These could be worse in pastoralists' community because of their compromised nutrition status.

Unsafe drinking water, along with poor sanitation and hygiene, are the main contributors to an estimated 4 billion cases of diarrhoeal disease annually, causing more than 1.5 million deaths, mostly among children under 5 years of age (WHO 2005). Because diarrhoeal diseases inhibit normal ingestion of foods and adsorption of nutrients, continued high morbidity also contributes to malnutrition, a separate cause of significant mortality; it also leads to impaired physical growth and cognitive function, reduced resistance to infection, and potentially long-term gastrointestinal disorders. Contaminated drinking water is also a major source of hepatitis, typhoid and opportunistic infections that attack the immuno-compromised, especially persons living with HIV/AIDS. As part of its Millennium Development Goals, the United Nations expressed its commitment by 2015 to reduce by one half the people without sustainable access to safe drinking water. Current estimates are that there are still 1.1 billion people without this access (WHO/UNICEF 2006).

According to Boot M, S Cairncross (1993) explains that Water supply, sanitation, and hygiene and health are closely related. Inadequate quantities and quality of drinking water, lack of sanitation facilities, and poor hygiene cause millions of the world's poorest people to die from preventable with diarrheal, water-based diseases and water-related

vector-borne diseases, skin and eye infections (trachoma), high chemicals water (like arsenic and nitrates) can cause serious disease, Water borne i.e viral hepatitis, typhoid, cholera, dysentery and other diseases that cause diarrhea.

Diarrheal diseases account for 4.3% of the total global disease burden (62.5 million). An estimated 88% of this burden is attributable to unsafe drinking water supply, inadequate sanitation, and poor hygiene (Water AID 2001).

Improved hygiene (hand washing) and sanitation (latrines) have more impact than drinking water quality on health outcomes, specifically reductions in diarrhea, parasitic infections, morbidity and mortality, and increases in child growth (Esrey et al 1991; Hutley et al 1997). Most endemic diarrhea is not water-borne, but transmitted from person to person by poor hygiene practices, so an increase in the quantity of water has a greater health impact than improved water quality because it makes it possible (or at least more feasible) for people to adopt safe hygiene behaviors (Esrey et al 1996). Despite the complex nature of the interaction between infectious diseases and malnutrition, it is generally accepted that infectious diseases can affect children's growth once complementary feeding is initiated. An infectious disease can lead to a reduction in food intake owing to anorexia (Tomkins, A. & Watson, F.1989).

Poor health and nutrition detrimentally affected children's development. However, good health and nutrition alone were insufficient to promote optimal child development, and quality of the psychosocial environment was also important. It was the need to look at the children's development in a holistic way and take an integrated approach to child services (Sally M. G et al 1991). Breastfeeding is an important way of providing ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive

process with important implications for the health of mothers. Breast milk is the natural first food for babies, it provides all the energy and nutrients that the infant needs for the first months of life, and it continues to provide up to half or more of a child's nutritional needs during the second half of the first year, and up to one-third during the second year of life. Exclusive breastfeeding for 6 months is the optimal way of feeding infants. Thereafter infants should receive complementary foods with continued breastfeeding up to 2 years of age or beyond. This one can be established and sustained through: Initiation of breastfeeding within the first hour of life, then Exclusive breastfeeding – that is the infant only receives breast milk without any additional food or drink, not even water ,Breastfeeding on demand that is as often as the child wants, day and night. Lastly no use of bottles, teats or pacifiers Breast milk promotes sensory and cognitive development, and protects the infant against infectious and chronic diseases. (Kramer M et al, 2001)

Kathryn et al (2001) in their study about effects of exclusive breastfeeding for four versus six months on maternal nutritional status and infant motor development found out those infants who were exclusively breastfed (EBF) until 6 months had high Maternal weight loss between 4 and 6 months while those who introduce hygienic complementary foods in addition to breast milk between 4 and 6 months had less nutritional burdens to the mothers in terms of recommended dietary allowance for energy, vitamin A, calcium and iron. Women in the EBF group were more likely to be amenorrhea at 6 months than women in the Solid Foods group at four months, which conserves nutrients such as iron. It was further found out that exclusive breastfeeding for 6 months confers an advantage in prolonging the duration of lactation amenorrhea in mothers who breastfeed frequently (mean 10–14 feedings/day). However, it was found out those Infants in the EBF for 6

months group crawled sooner and was more likely to be walking by 12 months than infants in the Solid Foods at four months group. Thus exclusive breastfeeding for six months has more advantages than when is done for four months. From their findings, it was found out that exclusive breastfeeding for 6 months has protective effects against gastrointestinal infection, diarrhea or pneumonia, and helps for a quicker recovery during illness. However no evidence on protective effect against respiratory tract infection in infants exclusively breastfed for 6 months compared to infants exclusive breastfed for 4–6 months.

According to WHO (2002) higher postpartum weight loss in mothers who exclusively breastfed for 6 months compared with mothers who exclusively breastfed for 4 months. In addition it was found out that in developing-country settings, the most important potential advantage of exclusive breastfeeding for 6 Months versus exclusive breastfeeding for 4 months relates to infectious disease morbidity and mortality, especially that due to gastrointestinal infection (diarrhea disease) thus exclusive breastfeeding for 6 months would protect against diarrhea morbidity and mortality. Besides evidence that exclusive breastfeeding to 6 months can lead to iron deficiency in susceptible infants, these risks must outweigh the benefits provided by exclusive breastfeeding, especially the potential reduction in morbidity and mortality. From the findings, after six months, when complementary feeding has been introduced, breast milk continues to provide substantial amounts of key nutrients well beyond the first year of life, especially protein, fat, and most vitamins thus breastfeeding should continue to at least two years (Dewey 2001).

When breast milk is no longer enough to meet the nutritional needs of the infant, complementary foods should be added to the diet of the child. The transition from exclusive breastfeeding to family foods, referred to as complementary feeding, typically covers the period from 6 to 18-24 months of age, and is a very vulnerable period. It is the time when malnutrition starts in many infants Complementary feeding should be timely, adequate and appropriate (UNICEF 2003). WHO recommends that infants start receiving complementary foods at 6 months of age in addition to breast milk, initially 2-3 times a day between 6-8 months, increasing to 3-4 times daily between 9-11 months and 12-24 months with additional nutritious snacks offered 1-2 times per day, as desired (WHO, J. Muriel 2008). During this period of complementary feeding Educational program based on the hazard-analysis-critical-control-point approach are critical. Infants and young children are very susceptible to food borne diseases and, if they consume contaminated foods, are likely to contract infections or intoxications leading to illness and often death. While food borne diseases that cause diseases frequently accompanied by diarrhea. Infections due to pathogenic E. coli are probably the commonest illnesses in developing countries and produce up to 25% of all diarrhea episodes (WHO 1992). In Kenya 44% of dishes are unsafe from a hygienic point of view. Hazard analyses carried out in households in the Dominican Republic reported that kitchen knives and blenders were contaminated with Salmonella spp., and several studies have indicated that babies bottles are not always effectively washed or boiled. (Rowland & McCollum1985, Black et al.1981, 1982, 1984)

Family Economic status

According to Friedman (1957) Economic status represents the economic capacity of families to meet their material and non-material needs. Families with low income levels are disproportionately represented by a provisional reduction in the current income that will usually suggest a high ratio of consumption to income. Expenditure also largely depends on income and assets. It represents an even more direct means to achieve human well-being. Families' perception on availability of money to make ends meet are not uniform, however, it is even closer to indicating overall family economic status. Bindon and Vitzhum (2003), Werner et al., Goode, (1999); Marmot, (2004); (2007) in their studies have reported that When placing a family into different economic categories some or all of the three variables income, education, and occupation. Some researchers have categorized the family economic status into three categories, poor, average and rich (Dao et al., 2006). Quality of life is another construct related to family economic status. Several indicators were used by (Xavier et al., 2003) to measure quality of life.

These indicators were included level of satisfaction and well-being of health, activity, income, social life, and relationship with family members (Xavier et al., 2003). Conventionally, indicators of socio economic status is measured financially using income or consumption expenditure, based on the proposition that material living standards reflects well-being (Falkingham & Namazie, 2002). According to Friedman (1957) permanent income hypothesis confirmed that families are likely to base their consumption on times of income fluctuation, for example, by borrowing or drawing on savings during times of low income. There are abundance evidence of quantitatively large association between many measures of economic status including income and

wealth and variety of health outcome such as mortality and mobility. Poor health may restrict family capacity to earn income or accumulate assets by limiting work or raising medical expenses (James P Smith 1999).

Numerous cross-sectional studies have been documented to show the associations between preschool nutritional status and subsequent human capital attainments (Pollitt 1990, Grantham-McGregor et al. 1999). However, as Behrman (1996) notes, many of these studies document associations between preschool malnutrition and subsequent attainments, not causal relationships. Preschooler health and subsequent educational attainments both reflect household decisions regarding investments in children human capital. Having reviewed these studies, Behrman (1996) found out that because associations in cross-sectional data may substantially over- or understate true causal effects, however, much less is known about the subject than is presumed. (G.M. Westcott, R.A.P Stott 1977) Claimed that the main cause of malnutrition is the broken homes and destitution which often result from migrancy. The teaching of nutritional principles alone is probably ineffective; budgetary advice and measures towards economic rehabilitation are more likely more relevant. Resource especially agricultural ones seem to play major role in war against malnutrition. More mothers who had eggs, milk or vegetables available at home had children well nourished. While the effect of a vegetable garden was not great; however, the possession of a field has significant effect of its own on malnutrition. Wealth differences within livestock keeping pastoralist communities have little bearing on nutritional status, a fact attributed to a "moral economy" where wealthier households share milk and livestock with poorer relatives in nomadic communities (Fratkin 2004, Roth 1990, Sellen 2003). However, adult women

show greater undernutrition than adult men, a fact which may be due to higher energy consumption associated with domestic labor and childbearing (Fujita et al. 2004), and differential consumption associated with male privilege (Fratkin 2004 and Smith 1995).

The long-term aspects of the socio economic status take a while before being related to various health outcomes, adding to the reasons for choosing consumption expenditure over income. In addition, collecting consumption expenditure data requires an extended questionnaire that must be done by skilful and experienced interviewers (Laura et al., 2008). Wealth is a source of economic security providing a family's ability to meet emergencies or absorb economic shocks such as unemployment. However, the importance of wealth as a source of economic security may vary among societies. Income and wealth are completely correlated, but they are not exchangeable, as revealed by the example of an elderly person with a modest fixed income but substantial accumulated wealth (John et al., 2002). In addition, family socio economic status can be determined through an asset-based approach. In the case of data on income or consumption expenditure lacking, information on possession of a range of durable property can be used (Falkingham & Namazie, 2002; Rutstein & Johnson, 2004). According to John et al., (2002) the income sources such as interest dividends, income from rental properties, child support and alimony are considered in a calculation of family income. In addition, family income may also include income earned from the "informal economy" (e.g., jobs that pay cash but have no benefits or job security), particularly in communities of immigrants and minorities, as well as informal transfers (e.g., of goods and services). According to John et al (2002). Family incomes cannot be comparing without knowledge of the family size. The impact of a given income is significantly dependent on family size

and composition. However this has a number of limitations when using income as an indicator. Firstly, analysis of income is likely to be open to reverse arguments. Secondly, income is a more unstable measure than education or occupation, and is sensitive to changes in life circumstances.

Studies by Magrabi et al (1992) states that expenditure includes consumption and non-consumption items such as education and taxes. Usually, to a certain degree, the household expenditure depends on family size; however, some families tend to spend more than others, even with the same size. Therefore, family expenditure also is use to examine the inequality in distribution of expenses. Any consumption estimate largely depends on what items are counted as consumption. It will be the aggregation of family expenditure on food, house rental; utilities, health, clothing, transportation, entertainment, furniture and appliances.

Family size

Global population grows each year by approximately 80 million people. Nearly all of this growth is concentrated in the developing nations of the world, in many of which fertility rates remain high (Da Vanzo et.al. 2006). World fertility rates have been declining from 4.0 for 1975-1980, 3.6 (1980-1985), 3.4(1985-1990), 3.1 (1990-1995) and 2.9 for 1995-2000. Though such figures may be considered as declining, many countries the world over have been experiencing high fertility rates. Various factors may be identified as the major projectors of such increases worldwide (www.unep.org 2006).

The relationship between infant mortality and fertility has been subject of debate among population analysts. It is assumed that high fertility is a necessary biological and

behavioral response to high mortality (Scrimshaw 1978). DONALD et al (1977) in his Studies of family size and malnutrition found out those families with 4 or fewer children, 37.8 percent of the children were malnourished. In families with five or more children, 44.1 percent of the children were malnourished. This has made those with smaller family sizes better-off in terms of their families' economic status and quality of life. This contradicts with Berker et al (2001) where it was identified that growth assumes endogenous fertility and a rising rate of return on human capital as the stock of human capital increases. When human capital is abundant, rates of return on human capital investments are high relative to rates of return on children, whereas when human capital is scarce, rates of return on human capital are low relative to those on children. As a result, societies with limited human capital choose large families and invest little in each member; those with abundant human capital do the opposite. This subsumes that the quality of a family is dependent on the size of the human capital and that of the number of children.

Ominde et al (1972) also in their writing, 'Population growth and economic development in Africa' indicated that fertility (family size) are differences in age at marriage and in numbers marrying, prevalence of polygamy in African marriages with the possibility of favoring some wives in the making of love. High divorce and widow rate also has been espoused as a factor for the relative family size. High fertility rates have historically been strongly correlated with poverty, high childhood mortality rates, low status and educational levels of women, deficiencies in reproductive health services, and inadequate availability and acceptance of contraceptives. Falling fertility rates and the demographic transition are generally associated with improved standards of living, such as increased

per capita incomes, increased life expectancy, lowered infant mortality, increased adult literacy, and higher rates of female education and employment (Arthur A.C., 2005).

2.4. Conceptual Framework

The conceptual framework below indicates the dependent and independent variables whose relationship was tested.

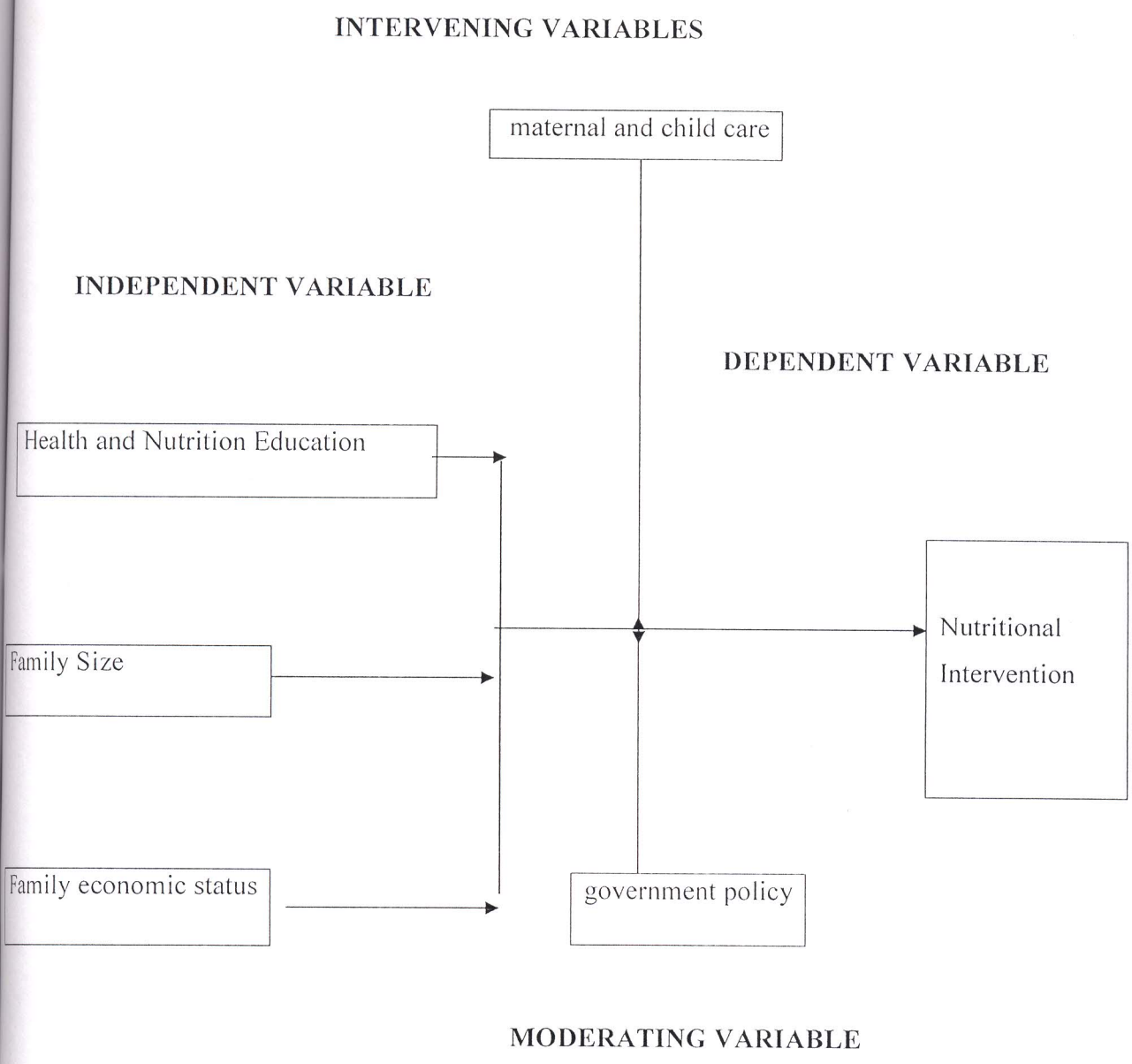

Figure 2 Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter is about the way the research is organized. The research methodology is discussed under the following subsections; Research Design, Population, Sampling Technique, Data Collection Methods, Data Analysis Methods, validity and reliability of data collecting instruments.

3.2 Research Design

The research employed a descriptive survey in order to attempt to explore the relationship between the independent and dependent variables above. By applying descriptive survey, helps the researcher to have a systematic data collection, summarize numerous data to graphical and numerical techniques that is simpler, more understandable terms thus makes it easier for decision making.

3.3 Target population

The target population for study was 350 (225 children between 6-59 months in SFP program, 81 between 6-59 months in OTP program and 44 pregnant and lactating in SFP program) in nutritional intervention program within Mandera East and North districts. This is as classification by the WHO Child Growth Standard, 2006 as either moderate acute malnutrition who are admitted in SFP program or severe acute malnutrition who are admitted in OTP program. Questionnaires and an appropriate interview schedule. The reason for the above target of children between 6-59 months is

because at six months is the recommended age by WHO/UNICEF for complementary feeding. At this age, it is believed that breastfeeding alone does not provide adequate nutritional requirements of baby. However appropriate, adequate and timely complementary foods which are hygienically prepared is priority. At this stage malnutrition is likely to set in if proper feeding is not done. While pregnant and lactating have extra nutritional needs due to their status. The population was drawn from 9 divisions in the districts namely Rhamu (71), Rhamu dimtu (51), Ashabito (33), Khalilio (15), Fino (15),Lafey (15), Warankara (67), Hareri (15) and Libehya (24). This was be done by checking of program registers to identify registered beneficiaries, where their details including location are kept. This gave the researcher direction on target households of the registered beneficiaries. The unit of analysis in this study was household.

Table 3.1: Target Population

	Division	TOTAL Population size	Pregnant and lactating mother population	6-59 months children SFP population	6-59 months OTP children population
1.	Rhamu	71	9	47	15
2.	Rhamu Dimtu	51	6	33	12
3.	Ashabito	33	4	21	8
4.	Khalalio	15	2	9	4
5.	Fino	15	2	9	4
6.	Lafey	59	7	39	13
7.	Warankara	67	9	43	15
8.	Hareri	15	2	9	4
9.	Libehya	24	3	15	6
	TOTAL	350	44	225	81

3.4 Sampling procedure

In order to adequately cover each of the nine divisions, since all beneficiaries of the program are recorded in the register and have ration card with their full details, identification of beneficiaries was not problem. Sample was selected by proportional sampling technique to get sample size of each division; each sample unit was selected through simple random sampling technique which was drawn from study sample

generated by Yamean formula. Bulla is the smallest informal settlements within the community which form basis of selection of the sample unit. The sample units were selected by Systematic sampling technique where only the first sample unit was selected at random and the remaining units are automatically selected in a definite sequence at equal spacing from one another. For this case the 3rd sample unit was selected. This was arrived at by dividing total population by the sample size.

=350/186

= approximately 2, giving us 2nd sample unit

3.4.1 Sample size

By applying Yamean formula (1967)

$n=N/1+N(e^2)$

Where

n = sample size

N = total population

e = sampling error.

Applying the above formula, sample size was determined by

$n=350/1+350(0.05)^2$

$=350/1+350(0.0025)$

=350/1.875

=186

The level of precision/sampling error±5

The confidence level 95%

Table 3.2: Sample size

Table 3.2 show the proportional of sample size in different divisions of study based on target group.

	Division	TOTAL sample size	Pregnant and lactating mother sample size	6-59 months children SFP sample size	6-59 months children OTP sample size
1.	Rhamu	21	3	11	4
2.	Rhamu Dimtu	14	2	9	3
3.	Ashabito	11	1	7	3
4.	Khalalio	7	1	4	2
5.	Fino	45	6	23	12
6.	Lafey	20	2	12	4
7.	Warankara	24	3	15	6
8.	Hareri	44	6	23	12
9.	Libehya	11	1	7	3
	TOTAL	**186**	**25**	**112**	**49**

3.5 Method of Data Collection

Survey method of data collection was adopted where information was gathered through one to one interview technique. A questionnaire composing of well chosen questions was developed to capture both independent and dependent variables. Pretest of the instrument was done in Mandera central district to determine any weakness. Questions were keenly selected to have right content, choosing wording carefully and proper sequence to ensure that questions relate to each other. Anthropometric measurement weight for height Z score (WFH) was taken to children 6-59 months while MUAC measurements were done to both pregnant and lactating mothers. Both open and closed ended questions were utilized. Prescribed set of these structured questions was developed based on fixed order that generally require the respondent to respondent to one or more fixed options. This method ensures rapid coding and analysis, easy quantification of data consequent compatibility of responses and guaranteed coverage of the area of interest. For extra information observation was used. The relevant secondary data was sourced from MoPHS and MoMs.

3.5.1 Validity

According to Anderson, B. (1966) found out that validity involves giving the accuracy of the tools used, giving the right measurements. Validity was achieved through pretest to the questionnaire and interviews was done in Mandera Central to enable the researcher be sure of the anthropometric tools and to conceptualize how big the questionnaire was and how much time was required to answer the questions.

3.5.2 Reliability

Reliability estimates the consistency of the tools used in measuring meaning, if the instrument is used under same condition on several occasions, it gives the same results. This was achieved through pretesting the questionnaire which was the researcher's main data collection tool in Mandera East, which is the location having the same conditions as area of research. This was involve administering questionnaires to beneficiaries of nutrition intervention within that area.

3.5.3 Operational definitions of variables

Variables in the study was translated into measureable elements so as develop an index of concept. The table 3.3 indicates the operational framework of the variables.

Table 3.3: Operational variables

INDEPENDENT VARIBLES	INDICATOR	MEASURE(S)	MEASUREMENT SCALE
Health and Nutrition Education	Best practice adopted	Observation	Nominal
	Question answer session	The number of questions answered rightly	Ordinal
Family size	Family members sharing common pot	Number of individual in a house hold	Ordinal
Family economic status	Assets	Number of assets per household	Ordinal
	Expenditure	Average monthly expenditure	Ordinal
	Income	Average monthly income	Ordinal
Dependant Variable			
Cure rate	Patient admitted with malnutrition	% of those discharged cure rate	Ordinal

3.6 Data analysis

For one to interpret information, drawing conclusion and making decision, proper data analysis is critical. With various data analysis methods, the choice depends on problem being investigated, the nature of data and the level of precision required among other considerations. Data entry and processing was done by SPSS (Version 17.0) computer package. Nutritional Status Cut-off Points 2 WHO (2005): Anthro 2005 Version 2.02 Standards Weight-for-height (WFH) Wasting for Children. The prevalence of wasting (a reflection of the current health/nutritional status of an individual) were presented as global acute malnutrition (GAM) and severe acute malnutrition (SAM) using weight-for-height (WFH) Z scores and MUAC indices.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, INTERPRENTATION AND DISCUSSION

4.1 Introduction

This chapter presents findings of a study done on malnourished children (6-59 months), pregnant and lactating mothers in Mandera east and north districts. The findings the general relation on the characters of the respondents and analyze the key explanatory variables as captured in the objectives. Percentages, cross tabulation and correlation measurements are the key methods used in the analysis.

4.2 Response Rate

The research had 80% of the respondents who successfully filled the questionnaires.

Table 4.1 Response rate

Tables 4.1 indicate the target group which was interviewed, the respective target sample size per each group and the actual number of interviewees who responded to the questionnaire. Among the pregnant and lactating mothers, 7 of them had been successfully cured after being subjected to nutritional intervention while 15 were still under rehabilitation.

	Target Group	Target sample size	Response number
1	Pregnant & lactating mothers	25	22
2	Moderately malnourished	112	89
3	Severely malnourished	49	38
TOTAL		**186**	**149**

4.3 General Information

Literacy level

Literacy level considered in terms of formal education which was studied in three levels; no education, primary education and secondary education. The table 4.2 reports on the level of respondents who are divided in to four groups children under five years who are severely malnourished, moderately malnourished, mothers who are malnourished and health ones who cured by nutrition intervention.

Table 4.2 Literacy Levels

Table 4.2 shows how different categories of beneficiaries in nutrition intervention who were researched on, their education background.

	severely Malnourished		Moderately Malnourished		malnourished pregnant & lactating mothers		Health pregnant & lactating mothers	
No Education	30	79%	58	66%	13	91%	4	57%
Primary	8	21%	26	30%	2	9%	3	43%
Secondary	0	0%	7	4%	0	0%	0	0%

From the table 4.2, it is evident that the level of education has great impact on nutritional status, which might have been attributed by the fact that those with better education level

could be adhering to instructions concerning foods given thus able to improve on their nutritional status. Among the severely malnourished 79% did not have any formal education compared with 66% of moderately malnourished households of children under five years. It should be noted that primary school is the highest level attained by the caretaker of the baby. While on other hand, all selected pregnant and lactating mothers were malnourished, however after intervention, some improved their status to health mothers who had 43% had at least primary school education. Among malnourished pregnant and lactating mothers 91% did not have any formal education.

4.4 Health and Nutrition Education in Nutritional Intervention Program

4.4.1 Accessing to a toilet facility

Good hygiene is the foundation of better health; this can be promoted through proper personal and environmental hygiene where waste disposal is among the key issues. The ability to access proper toilet/ latrine has impact on controlling diarrhea, if poorly disposed; it will always affect the food we consumed through running water or insects from the wastes to the food. This has adverse effect on nutritional status because the infected food is never utilized in the body but weaken it which is double burden for malnourished cases. The table 4.3 describes how the respondents access toileting facilities which is divided in four levels; VIP toilet, traditional pit latrine, bush and open field.

Table 4.3: Waste disposal

	severely Malnourished		Moderately Malnourished		malnourished pregnant & lactating mothers		Health pregnant & lactating mothers	
VIP Toilet	0	0%	0	0%	0	0%	0	0%
Traditional pit Latrine	1	3%	6	7%	0	0%	1	6.7%
Bush	28	74%	60	67%	6	85.7%	13	86.7%
Open field	9	23%	23	26%	1	14.3%	1	6.7%

Following the response from the interviewees, severely malnourished children households, 3% use traditional latrine and 7% among moderate malnourished with none of them having access to latrine. There is higher percentage of household which access toilets among the moderate malnourished compared to severely malnourished, generally it is very low. On the other hand nobody among malnourished mother has access to VIP toilets or traditional toilets with only 6.7% of health mothers accessing traditional toilets. Majority of the households' access bush to dispose their waste which is a bad culture because it enhance spread of diseases which negatively affects nutritional status.

4.4.2 Critical hand washing times

Hands are the main mode of transmission of microorganism in to the body this is due to the fact they are in direct conduct with foods. If high hygiene standards of the hands are observed, cases of transmission are limited.

The four main critical times to wash hands are after long call, before eating, before preparing food and after cleaning the baby feaces. The table 4. 4 analyzes the hand washing practices by community based on the four critical times that is after going for long call, before eating food, before preparing food and after cleaning baby's bottoms.

Table 4.4 Hand washing practice

	severely Malnourished		Moderately Malnourished		malnourished pregnant & lactating mothers		Health pregnant & lactating mothers	
After going for long call	4	11%	22	25%	1	14%	5	33%
Before eating food	33	85%	67	75%	6	86%	9	60%
Before preparing food	2	4%	0	0%	0	0%	0	0%
After cleaning baby's bottoms	0	0%	0	0%	0	0%	1	7%

General observation is that majority of the households interviewed clean their hand before eating food. Among children under five moderately malnourished children, 25% of their households clean their hands after going for long call compared with 11% of severely malnourished. Human waste is known to be the best habitat for microorganisms thus if not well handled can cause a lot of diseases which could be a contributing factor among severely malnourished children.

On the other hand 33% of health pregnant and lactating mothers practice hand washing after going for long call compared to 14% of the health mothers. Therefore it can be interpreted that, those with good hand washing practice after going for long call are most likely having less infections thus have better nutritional status compared to those who do not.

4.4.3 Items used to wash hands

Different items are used in hand cleaning depending on accessibility of cleaning item. Communities adopt strategies based on available resources. In line with this, four key items were identified as commonly used by the community living in Arid and Semi arid areas. The table 4.5 indicate the four items namely water & soap, ash, plain water and soil/sand.

Table4.5 Agents used for handing washing

	severely Malnourished		Moderately Malnourished		malnourished pregnant & lactating mothers		Health pregnant & lactating mothers	
Water & Soap	18	47%	56	63%	4	57.1%	11	73.3%
Ash	4	12%	12	13%	0	0.0%	0	0.0%
Plain water	7	18%	20	23%	3	42.9%	4	26.7%
Soil or sand	9	24%	1	1%	0	0.0%	0	0.0%

The research shows that water and soap is commonly used among households with children under five where high number of moderately malnourished children 63% use water and soap compared to severely malnourished households with 47%, soil or sand is second commonly used by household of severely malnourished.

Among mothers 73.3% of health mothers household clean their hands using water and soap while 57.1% of malnourished mothers do use the soap and water. This implies that those who clean hand well have a better nutritional status than those who do not. Community capacity building on how and importance of cleaning hands should be emphasized.

4.4.4 Source of information about diarrhea

Within the community, information sources varies thus some rely on scientific reached information others follow keenly on rumors and myths. Based on these facts, the study looked at four main sources of information. These are Voluntary health workers (VHW), health workers, neighbors/friends/relatives and opinion leaders.

Table 4.6 source of health information

	severely Malnourished		Moderately Malnourished		malnourished pregnant & lactating mothers		Health pregnant & lactating mothers	
VHPs	1	3%	0	0%	0	0.0%	0	0.0%
From health workers	29	77%	86	97%	1	14%	11	73.3%
Neighbors, Friends or relatives	6	14%	3	3%	1	14%	0	0.0%
Opinion leaders	2	6%		0%	5	72%	4	26.7%

The study results showed that Health workers are the main source of information concerning health affairs with 77% of severely malnourished households confirming that they have heard about diarrhea from them. Among the moderately malnourished households 97% confirmed that they have heard information from health workers and seem to be taking measures as per advice given compared to severely malnourished.

Health workers and opinion leaders were the main source of information concerning health affairs among pregnant and lactating women, 73.3% of health mothers obtained information from healthy workers whereas 72% of moderately malnourished obtained information from opinion leaders. Since health workers are professionals in the field, very reliable is assured to have been delivered thus reason for better nutritional status among the health mothers and moderately malnourished children compared to malnourished mothers and severely malnourished children respectively.

4.5 Effect of Family Size on nutrition status

4.4.5 Number of H/H members

The larger the number of household members has both advantages and disadvantages. The main advantage is that they be good source of labor thus having positive impact on food production while the demerit is that in case of food shortage, they are highly affected especially vulnerable group. It is for these reasons that the household members were divided as below in table 4.7

Table 4.7 Household size

	severely Malnourished		Moderately Malnourished		malnourished pregnant & lactating mothers		Health pregnant & lactating mothers	
0-2 Members	3	9%	11	12%	1	14%	0	0.0%
3-6 Members	5	12%	56	63%	4	57.0%	11	71.4%
7-10 Members	29	77%	16	18%	2	28%	4	28.6%
10above members	1	2%	6	7%	0	0.0%	0	0.0%

The larger number of household members, the more demand for food thus high rates of malnutrition. Within severely malnourished households, 77% of household members belongs to members between 7-10 members thus high demands compared to moderately malnourished where with 18% in the same category thus more cases of severe malnourished households are most likely sharing the food given to the malnourished children.

Among pregnant and lactating mothers, majority of 71.4% health mothers have families between 3-6 members and 57% in the same category of malnourished mothers. The bigger the family, the more demand for food, smaller family size has positive influence on nutritional status compared to large family size as observed in health pregnant and lactating mothers.

4.6 Influence of family economic status in nutritional intervention

For one to spend, he must have source of income. In most cases rural communities do not over rely on employment thus have other source. In light of this, the research analyzed sources of income in terms of sale of livestock , sale of live stock products, sale of own crop, wage labor, salaried employment, barter trade, sale of charcoal, beadwork

Table 4.8 sources of income

	severely Malnourished		Moderately Malnourished		malnourished pregnant & lactating mothers		Health pregnant & lactating mothers	
Sale of livestock	13	34%	31	35%	3	43%	5	29%
Sale of livestock products	6	16%	22	24%	1	20%	2	16%
Sale of own crop	2	4%	0	0%	0	0%	0	0%
Wage labor	7	20%	26	29%	2	25%	6	43%
Salaried employment	1	3%	0	0%	0	0%	2	12%
Barter trade	2	4%	5	6%	0	0%	0	0%
Sale of charcoal/firewood	3	9%	5	6%	1	12%	0	0%
Beadwork	0	0%	0	0%	0	0%	0	0%
Small scale Business	4	10%	0	0%	0	0%	0	0%

Sale of livestock, wage labor and sale of livestock products are the main sources of income in the community. 50% of severely malnourished have income source is from sale of livestock and their products while 59% of moderately malnourished get income from sale of livestock and their products. It is perceived that the families which sale these

products, at least feed them to their families and only sale surplus, if not, they sale in exchange of other food stuffs thus better nutritional status in moderate than severe group. Household of Severely malnourished children rely on wage labor by 20% while those of moderately malnourished by 29%. It is perceived that the wage labor is more sustainable that livestock which succumb to changes in climatic condition and mostly affect pastoralist which is the sole means of livestock keeping by the community.

Among the mothers, 63% of malnourished mothers depend on livestock and its product as source of income while their counterparts the health mothers rely on it by 45% .The health mothers have more emphasize on labor wage by 43% compared to 25% of malnourished mothers. It can be said the amount got from the labor is directly injected in family food purchase thus better nutritional status of health mothers compared to malnourished mothers.

Accessing Food in a Normal Year

Beside food availability being a matter of concern, food accessibility is very important. Food may be near a person, but you don't have capacity to access it, you are as good as not having it. Based on that, four key factors were used in the study to determine the community ability to access food.

Table 4.9 Sources of food

	severely Malnourished		Moderately Malnourished		malnourished pregnant & lactating mothers		Health pregnant & lactating mothers	
I buy half of my food at the local market	12	29%	18	20%	2	26.7%	8	50.0%
Food aid	15	41%	35	37%	3	40%	3	21.4%
Grow/produce more than half of my food that I consume	0	0%	4	5%	0	0%	0	0.0%
Borrowing	2	6%	4	5%	0	0%	0	0.0%
Buy almost all of my food	9	24%	29	33%	2	33.3%	4	28.6%

Most of the people interviewed access food through Aid. Moderately malnourished children households, 37% access food through food aid while 41% of severely malnourished get it through the same. It is clear that majority of the community rely on well wishers for their survival however the AID given does not meet all the required needs. To supplement this, 24% of severely malnourished children households buy almost all of their food while 33% of moderately malnourished do access it through the

same. The high purchasing power by moderately malnourished household might be cushion on them whenever there is pipeline breakdown of food Aid thus helping them have a better nutritional status.

Among the malnourished mothers 26.7% buy half of their food while 50% of the health mothers buy half of their food. It is clear that those with a better purchasing power have better nutritional status than those of low purchasing power. On the other hand, 40% of malnourished mothers' access food through food aid and 21.4% access through the food aid. Since food Aid is not sustainable, majority who rely on food aid thus any problem with distribution has a big impact on their nutrition status.

4.8 Correlation Analysis on factors affecting cure rate of malnourished households

The data presented before on health and nutrition education, family size and family economic status were computed into single variables per factor by obtaining the averages of each factor. Pearson's correlations analysis was then conducted at 95% confidence interval and 5% confidence level 2-tailed.

Table 4.10: Correlation Matrix on cure rate verses independent variables

	Cure rate
Cure rate (r) (p) Sig. (2 tailed)	1.000
Health and Nutrition Education (r) (p) (2 tailed)	0.894 0.018
Family size (r) (p) Sig. (2 tailed)	-0.027 0.031
Family economic status (r) (p) Sig. (2 tailed)	0.493 0.031

The table 4.10 indicates the correlation matrix between the factors (health and nutrition education, family size and family economic status) and cure rate. According to the table, there is a positive relationship between cure rate and health and nutrition education and family economic status of magnitude 0.894 and 0.493. The positive relationship indicates that there is a correlation between the factors and the cure rate with health and nutrition education having the highest value and family economic status having the lowest correlation value. On other hand , family size correlate negatively to the cure rate which indicate that the larger the family size, the less the cure rate.

This notwithstanding, all the factors had a significant p-value ($p<0.05$) at 95% confidence level. The significance values for relationship between cure rate and health and nutrition education, family size and family economic status were 0.018, 0.031 and 0.031

respectively. This implies that health and nutrition education was the most significant factor, followed by family economic status and family size was the least significant.

3.9 Discussion of Results

Findings by FAO (2002) states that Childhood malnutrition is still a serious global health problem especially in developing countries; its close link to poverty lead to its inclusion as the in the Millennium Development Goals. Nutrition Education being key factor in malnutrition intervention. It was concluded that dietary knowledge can go a long way towards protecting children from unfortunate family circumstances (Westcott and Stott, 1977). From the findings, majority of the community members use bush as their toilets, in the events of rains, human discharges mixes with water causing a lot of diseases. Unsafe drinking water, along with poor sanitation and hygiene, are the main contributors to an estimated 4 billion cases of diarrhea disease annually, causing more than 1.5 million deaths, mostly among children under 5 years of age (WHO 2005). Because diarrhea diseases inhibit normal ingestion of foods and adsorption of nutrients, continued high morbidity also contributes to malnutrition, a separate cause of significant mortality; it also leads to impaired physical growth and cognitive function, reduced resistance to infection, and potentially long-term gastrointestinal disorders. Boot (1993) explains that water supply, sanitation, and hygiene and health are closely related. Inadequate quantities and quality of drinking water, lack of sanitation facilities, and poor hygiene cause millions of the world's poorest people to die from preventable with diarrheal, water-based diseases and water-related vector-borne diseases, skin and eye infections (trachoma), can cause serious disease, Water borne viral hepatitis, typhoid, cholera, dysentery and other diseases that cause diarrhea. Diarrheal diseases account for 4.3% of

the total global disease burden (62.5 million). The research found out that four critical times recommended for hand washing are not keenly followed, these include after visiting toilet, after washing baby buttocks, before eating and before preparing food. Majority wash hands when dirty which is relative to individual perception of dirty thus I conjure Esrey et al (1991); (Hutley et al 1997) in their studies showed that Improved hygiene (hand washing) and sanitation (latrines) have more impact than drinking water quality on health outcomes, specifically reductions in diarrhea, parasitic infections, morbidity and mortality, and increases in child growth Most endemic diarrhea is not water-borne, but transmitted from person to person by poor hygiene practices, so an increase in the quantity of water has a greater health impact than improved water quality because it makes it possible (or at least more feasible) for people to adopt safe hygiene behaviors (Esrey et al 1996). Despite the complex nature of the interaction between infectious diseases and malnutrition, it is generally accepted that infectious diseases can affect children's growth once complementary feeding is initiated. An infectious disease can lead to a reduction in food intake owing to anorexia.

Families with low income levels are disproportionately represented by a provisional reduction in the current income that will usually suggest a high ratio of consumption to income. Expenditure also largely depends on income and assets. It represents an even more direct means to achieve human well-being. Families' perception on availability of money to make ends meet are not uniform, however, it is even closer to indicating overall family economic status. Wealth differences within livestock keeping pastoralist communities have little bearing on nutritional status, a fact attributed to a "moral economy" where wealthier households share milk and livestock with poorer relatives in

nomadic communities (Sellen 2003). Adult women show greater under nutrition than adult men, a fact which may be due to higher energy consumption associated with domestic labor and childbearing, and differential consumption associated with male privilege. The low income is found to have adverse effect on nutritional status of the people. This compromise on the ability to purchase essential commodities thus it is essential that program of economic empowering should be encouraged.

Income is the most important indicator of family economic status, as it provides a direct means to acquire goods and services that are considered fundamental to sustaining a healthy lifestyle. Income can be used as a quantitative variable and can be group into categories.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents key findings presented in chapter four, conclusions drawn, recommendation and makes suggestions for future relevant research.

5.2 Summary of the findings

It was found that the community has a very high illiteracy levels with most of them having no formal education with very few having primary education and even fewer who have completed secondary school. Majority of the interviewees use the bush and no toilet while many wash hands when they are dirty using water and soap although many also use plain water. Health workers are the main source of information to the community, while VHPs are the least in terms of giving of health empowerment. Hand washing is not practiced in the community as one of preventive and promotive measures. Among the four critical times which need to be observed in hand washing, the community is keen in cleaning hands before eating then after long call followed by before preparing food, then after cleaning baby's bottom. Ideally all these four critical times need to be adhered to in full to prevent diseases like diarrhea. In the event that they wash their hands, bigger number use just plain water, ash, soil or sand as opposed to using soap and water which has been proven more effective in removing germs. The community rely on health workers as their source of information concerning health matters. However VPHs, neighbors and opinion leaders have influence on empowering the community. The

number of family members is directly related to the demands, the smaller the size the less the demands compared to bigger size. On the other hand, bigger sizes have advantage if they are skilled in terms of labor thus in come. Majority of the families in Mandera have members between 7-10 among under and 3-6 in PLW. The community has invested heavily in livestock thus their livelihood depends on livestock and livestock products. However some have diversified to wage labor, salaried employment sale of charcoal and small business to supplement livestock. Dependant syndrome is a big deal in the community, many people depend on food aid to meet their nutritional needs, although some buy food from the earnings from labor, livestock and salaries.

5.3 Conclusion

The study revealed that health and nutrition education had effects on the nutritional intervention program, thus the study concludes that health and nutrition education affects the nutritional intervention program. For one to get health education, basic education is essential, however the community high illiteracy level with majority of them have not gone to school at all. While to have a successful nutritional intervention, it should include key issues like toilets and hand washing education should be given due attention to avoid recurrence of malnutrition cases in the community.

The study also established that the bigger the family size, the higher demand of food unless if the members are empowered economically, it becomes a burden to sustain especially in community which depends on food Aid.

The study further revealed that family economic status has positive effect on nutritional status of their family members. Households who have livestock and blended with other

sources of income such as wage and salaries have shown positive respond to their nutritional status.

5.4 Recommendation

1. Education programs should be emphasized as a means of community empowerment. Nutritional programs should be integrated with programs like hygiene and sanitations which involve toilet construction and empowering the community on the importance of maintaining high standards of hygiene.

2. Partners should start putting emphasize on development programs which are more sustainable with more focus on livelihood as opposed to short term projects which emphasize on reliance on Relief Aid thus posing high dependency syndrome.

5.5 Areas for further research

1. Research to be done on best development projects to be initiated with focus on community ownership. Since most of the project are emergency which are short term, not sustainable hence leaving the community in the same situation after funding period, example after many years of nutritional interventions, malnutrition rates are still high.

2. More studies be done on types of crops that can withstand high temperature with low rains since most of the community members depend on livestock for livelihood, mixed farming will be a great boost so that they can have both livestock and crops where viable.

3. Further research be done on high breed animals of high productivity as opposed to indigenous low productive. This will increase family income thus making them have high

purchasing power to enhance food security and consequently improve on their nutritional status.

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APPENDICES

Appendix 1 Letter of Transmittal

Dear Sir / Madam,

RE: LETTER OF TRANSMITTAL OF DATA COLLECTION INSTRUMENTS

This is to inform you that I am carrying out a research study leading to the award of Master of Project Planning and Management at University of Nairobi. The study focuses on "Factors affecting nutritional interventions on malnourished children (6-59 months), pregnant and lactacting mothers in mandera east district. This questionnaire is mainly designed to obtain more information about factors leading to high levels of malnutrition irrespective of various interventions

When the research is successfully completed the results will be useful to all intervening partners to adopt new strategies including NGOs, the government and community.

I will appreciate if you could answer the listed questions as honestly and objectively as possible.

All information provided will strictly be handled with confidentiality.

Thank you for your assistance and your precious time.

Yours faithfully

Kopi Samuel

Appendix II: Questionnaire for the beneficiaries

QUESTIONNAIRE

GENERAL INFORMATION

A.Region / District _____ B.Village / Settlement

_____

C.HH N° _____ D. Name of head of HH

_____

E. Sex _____ F. Age

_____

G. Occupation _____

H. Name of respondent _____Sex ____

Age_____

I. Position in HH _____

NUTRITIONAL STATUS

Q 1. a. Child age (months) ( ) b. Child Weight (Kg) ( ) c. Child Height (Ht) ( )

d. MUAC for mothers (cm)

HEALTH AND NUTRITION

Q2. Can you read and write?

1. Yes 2. No

Q3. If yes, what is the highest level of education you have attained?

1. Primary 2. Secondary

3. Never attended school 4. Other (specify)

_____

Q4.1 Does your household have access to a toilet facility that you use? [If NO, Skip to 4.3] [If 1=YES 2=NO]	**4.2** (If yes), What type of toilet do you have 1.= Bucket 2=Traditional pit Latrine 3= ventilated improved 4= flush toilet 5= Other specify____	**4.3** (If No), where do you go/use? (probe further) 1= Bush 2= Open Field 3= Near a water source 4= Behind the house 5= Other (specify) ____	**4.4** [OBSERVE] how children's faeces is are disposed 1= disposed of immediately and hygienically 2= Not disposed (scattered in the compound)	**4.5** Do you wash your hands before you feed your child? 1= YES 2= NO

Q5. When do you wash your hands?

1. After visiting the latrine 2. Before preparing food

3. Before eating food 4. After cleaning children

Q6. What do you use to wash your hands?

1. Water & Soap 2. Ash 3. Plain water 4. Soil or sand

Q.7. Have you heard any information about diarrhoea?

1. Yes 2. No

Q8. Where did you hear information about diarrhoea?

1. VHPs 2. From health workers 3. Neighbours, Friends or relatives

4. Opinion leaders' _____

FAMILY SIZE

9. Number of household members

< 5years		6-14 years		15-49 yrs		> 50 yrs	
M	F	M	F	M	F	M	F

FAMILY ECONOMIC STATUS

10. In the last three months what was the MAIN source of income for your household?

Codes:

1= Sale of livestock **2**= Sale of livestock products **3**= Sale of food ration **4**= Sale of own crop **5**= Wage labor **6**= Salaried employment **7**= Barter trade **8**= Remittances **9**= Sale of charcoal/firewood **10**= Beadwork **11**= Small scale Business **12**= Quarrying **13**= Other (Specify) _____

Expenditures

11. How do you access your food in a normal year? (tick as appropriate)

1. I buy half of my food at the local market 2. Food aid

3. grow/produce more than half of my food that I consume 4. Borrowing

5. Buy almost all of my food 6. Other_____

END QUESTIONNAIRE

Name of Interviewer/Enumerator: _____

Date Conducted: _____

Thank the respondent

Appendix III: Weight – for – Height Reference Card

0-2 years
Weight-for-Height Reference Card

Boys' weight (kg)					Length [a]	Girls' weight (kg)				
-4 SD	-3 SD	-2 SD	-1 SD	Médian	(cm)	Médian	-1 SD	-2 SD	-3 SD	-4 SD
1.7	1.9	2.0	2.2	2.4	45	2.5	2.3	2.1	1.9	1.7
1.8	2.0	2.2	2.4	2.6	46	2.6	2.4	2.2	2.0	1.9
2.0	2.1	2.3	2.5	2.8	47	2.8	2.6	2.4	2.2	2.0
2.1	2.3	2.5	2.7	2.9	48	3.0	2.7	2.5	2.3	2.1
2.2	2.4	2.6	2.9	3.1	49	3.2	2.9	2.6	2.4	2.2
2.4	2.6	2.8	3.0	3.3	50	3.4	3.1	2.8	2.6	2.4
2.5	2.7	3.0	3.2	3.5	51	3.6	3.3	3.0	2.8	2.5
2.7	2.9	3.2	3.5	3.8	52	3.8	3.5	3.2	2.9	2.7
2.9	3.1	3.4	3.7	4.0	53	4.0	3.7	3.4	3.1	2.8
3.1	3.3	3.6	3.9	4.3	54	4.3	3.9	3.6	3.3	3.0
3.3	3.6	3.8	4.2	4.5	55	4.5	4.2	3.8	3.5	3.2
3.5	3.8	4.1	4.4	4.8	56	4.8	4.4	4.0	3.7	3.4
3.7	4.0	4.3	4.7	5.1	57	5.1	4.6	4.3	3.9	3.6
3.9	4.3	4.6	5.0	5.4	58	5.4	4.9	4.5	4.1	3.8
4.1	4.5	4.8	5.3	5.7	59	5.6	5.1	4.7	4.3	3.9
4.3	4.7	5.1	5.5	6.0	60	5.9	5.4	4.9	4.5	4.1
4.5	4.9	5.3	5.8	6.3	61	6.1	5.6	5.1	4.7	4.3
4.7	5.1	5.6	6.0	6.5	62	6.4	5.8	5.3	4.9	4.5
4.9	5.3	5.8	6.2	6.8	63	6.6	6.0	5.5	5.1	4.7
5.1	5.5	6.0	6.5	7.0	64	6.9	6.3	5.7	5.3	4.8
5.3	5.7	6.2	6.7	7.3	65	7.1	6.5	5.9	5.5	5.0
5.5	5.9	6.4	6.9	7.5	66	7.3	6.7	6.1	5.6	5.1
5.6	6.1	6.6	7.1	7.7	67	7.5	6.9	6.3	5.8	5.3
5.8	6.3	6.8	7.3	8.0	68	7.7	7.1	6.5	6.0	5.5
6.0	6.5	7.0	7.6	8.2	69	8.0	7.3	6.7	6.1	5.6
6.1	6.6	7.2	7.8	8.4	70	8.2	7.5	6.9	6.3	5.8
6.3	6.8	7.4	8.0	8.6	71	8.4	7.7	7.0	6.5	5.9
6.4	7.0	7.6	8.2	8.9	72	8.6	7.8	7.2	6.6	6.0
6.6	7.2	7.7	8.4	9.1	73	8.8	8.0	7.4	6.8	6.2
6.7	7.3	7.9	8.6	9.3	74	9.0	8.2	7.5	6.9	6.3
6.9	7.5	8.1	8.8	9.5	75	9.1	8.4	7.7	7.1	6.5
7.0	7.6	8.3	8.9	9.7	76	9.3	8.5	7.8	7.2	6.6
7.2	7.8	8.4	9.1	9.9	77	9.5	8.7	8.0	7.4	6.7
7.3	7.9	8.6	9.3	10.1	78	9.7	8.9	8.2	7.5	6.9
7.4	8.1	8.7	9.5	10.3	79	9.9	9.1	8.3	7.7	7.0
7.6	8.2	8.9	9.6	10.4	80	10.1	9.2	8.5	7.8	7.1
7.7	8.4	9.1	9.8	10.6	81	10.3	9.4	8.7	8.0	7.3
7.9	8.5	9.2	10.0	10.8	82	10.5	9.6	8.8	8.1	7.5
8.0	8.7	9.4	10.2	11.0	83	10.7	9.8	9.0	8.3	7.6
8.2	8.9	9.6	10.4	11.3	84	11.0	10.1	9.2	8.5	7.8
8.4	9.1	9.8	10.6	11.5	85	11.2	10.3	9.4	8.7	8.0
8.6	9.3	10.0	10.8	11.7	86	11.5	10.5	9.7	8.9	8.1
8.7	9.5	10.2	11.1	12.0	87	11.7	10.7	9.9	9.1	8.3
8.9	9.7	10.5	11.3	12.2	88	12.0	11.0	10.1	9.3	8.5
9.1	9.9	10.7	11.5	12.5	89	12.2	11.2	10.3	9.5	8.7
9.3	10.1	10.9	11.8	12.7	90	12.5	11.4	10.5	9.7	8.8
9.5	10.3	11.1	12.0	13.0	91	12.7	11.7	10.7	9.9	9.0
9.7	10.5	11.3	12.2	13.2	92	13.0	11.9	10.9	10.1	9.2
9.8	10.7	11.5	12.4	13.4	93	13.2	12.1	11.1	10.2	9.4
10.0	10.8	11.7	12.6	13.7	94	13.5	12.3	11.3	10.4	9.5
10.2	11.0	11.9	12.8	13.9	95	13.7	12.6	11.5	10.6	9.7
10.3	11.2	12.1	13.1	14.1	96	14.0	12.8	11.7	10.8	9.9
10.5	11.4	12.3	13.3	14.4	97	14.2	13.0	12.0	11.0	10.1
10.7	11.6	12.5	13.5	14.6	98	14.5	13.3	12.2	11.2	10.2
10.8	11.8	12.7	13.7	14.9	99	14.8	13.5	12.4	11.4	10.4
11.0	12.0	12.9	14.0	15.2	100	15.0	13.7	12.6	11.6	10.6

[a] Length is measured for children below 87 cm. For children 87 cm or more, height is measured. Recumbent length is on average 0.7 cm greater than standing height, although the difference is of no importance to individual children, a correction may be made by subtracting 0.7 cm from all lengths above 86.9 cm if standing height can not be measured.

Ministry of Public Health and Sanitation & Ministry of Medical Services
2006 WHO Growth Standards

2-5 years
Weight-for-Height Reference Card

Boys' weight (kg)					Height* (cm)	Girls' weight (kg)				
-4 SD	-3 SD	-2 SD	-1 SD	Médian		Médian	-1 SD	-2 SD	-3 SD	-4 SD
5.4	5.9	6.3	6.9	7.4	65	7.2	6.6	6.1	5.6	5.1
5.6	6.1	6.5	7.1	7.7	66	7.5	6.8	6.3	5.8	5.3
5.7	6.2	6.7	7.3	7.9	67	7.7	7.0	6.4	5.9	5.4
5.9	6.4	6.9	7.5	8.1	68	7.9	7.2	6.6	6.1	5.6
6.1	6.6	7.1	7.7	8.4	69	8.1	7.4	6.8	6.3	5.7
6.2	6.8	7.3	7.9	8.6	70	8.3	7.6	7.0	6.4	5.9
6.4	6.9	7.5	8.1	8.8	71	8.5	7.8	7.1	6.6	6.0
6.5	7.1	7.7	8.3	9.0	72	8.7	8.0	7.3	6.7	6.1
6.7	7.3	7.9	8.5	9.2	73	8.9	8.1	7.5	6.9	6.3
6.8	7.4	8.0	8.7	9.4	74	9.1	8.3	7.6	7.0	6.4
7.0	7.6	8.2	8.9	9.6	75	9.3	8.5	7.8	7.2	6.6
7.1	7.7	8.4	9.1	9.8	76	9.5	8.7	8.0	7.3	6.7
7.3	7.9	8.5	9.2	10.0	77	9.6	8.8	8.1	7.5	6.8
7.4	8.0	8.7	9.4	10.2	78	9.8	9.0	8.3	7.6	7.0
7.5	8.2	8.8	9.6	10.4	79	10.0	9.2	8.4	7.8	7.1
7.7	8.3	9.0	9.7	10.6	80	10.2	9.4	8.6	7.9	7.2
7.8	8.5	9.2	9.9	10.8	81	10.4	9.6	8.8	8.1	7.4
8.0	8.7	9.3	10.1	11.0	82	10.7	9.8	9.0	8.3	7.6
8.1	8.8	9.5	10.3	11.2	83	10.9	10.0	9.2	8.5	7.7
8.3	9.0	9.7	10.5	11.4	84	11.1	10.2	9.4	8.6	7.9
8.5	9.2	10.0	10.8	11.7	85	11.4	10.4	9.6	8.8	8.1
8.7	9.4	10.2	11.0	11.9	86	11.6	10.7	9.8	9.0	8.3
8.9	9.6	10.4	11.2	12.2	87	11.9	10.9	10.0	9.2	8.4
9.1	9.8	10.6	11.5	12.4	88	12.1	11.1	10.2	9.4	8.6
9.3	10.0	10.8	11.7	12.6	89	12.4	11.4	10.4	9.6	8.8
9.4	10.2	11.0	11.9	12.9	90	12.6	11.6	10.6	9.8	9.0
9.6	10.4	11.2	12.1	13.1	91	12.9	11.8	10.9	10.0	9.1
9.8	10.6	11.4	12.3	13.4	92	13.1	12.0	11.1	10.2	9.3
9.9	10.8	11.6	12.6	13.6	93	13.4	12.3	11.3	10.4	9.5
10.1	11.0	11.8	12.8	13.8	94	13.6	12.5	11.5	10.6	9.7
10.3	11.1	12.0	13.0	14.1	95	13.9	12.7	11.7	10.8	9.8
10.4	11.3	12.2	13.2	14.3	96	14.1	12.9	11.9	10.9	10.0
10.6	11.5	12.4	13.4	14.6	97	14.4	13.2	12.1	11.1	10.2
10.8	11.7	12.6	13.7	14.8	98	14.7	13.4	12.3	11.3	10.4
11.0	11.9	12.9	13.9	15.1	99	14.9	13.7	12.5	11.5	10.5
11.2	12.1	13.1	14.2	15.4	100	15.2	13.9	12.8	11.7	10.7
11.3	12.3	13.3	14.4	15.6	101	15.5	14.2	13.0	12.0	10.9
11.5	12.5	13.6	14.7	15.9	102	15.8	14.5	13.3	12.2	11.1
11.7	12.8	13.8	14.9	16.2	103	16.1	14.7	13.5	12.4	11.3
11.9	13.0	14.0	15.2	16.5	104	16.4	15.0	13.8	12.6	11.5
12.1	13.2	14.3	15.5	16.8	105	16.8	15.3	14.0	12.9	11.8
12.3	13.4	14.5	15.8	17.2	106	17.1	15.6	14.3	13.1	12.0
12.5	13.7	14.8	16.1	17.5	107	17.5	15.9	14.6	13.4	12.2
12.7	13.9	15.1	16.4	17.8	108	17.8	16.3	14.9	13.7	12.4
12.9	14.1	15.3	16.7	18.2	109	18.2	16.6	15.2	13.9	12.7
13.2	14.4	15.6	17.0	18.5	110	18.6	17.0	15.5	14.2	12.9
13.4	14.6	15.9	17.3	18.9	111	19.0	17.3	15.8	14.5	13.2
13.6	14.9	16.2	17.6	19.2	112	19.4	17.7	16.2	14.8	13.5
13.8	15.2	16.5	18.0	19.6	113	19.8	18.0	16.5	15.1	13.7
14.1	15.4	16.8	18.3	20.0	114	20.2	18.4	16.8	15.4	14.0
14.3	15.7	17.1	18.6	20.4	115	20.7	18.8	17.2	15.7	14.3
14.6	16.0	17.4	19.0	20.8	116	21.1	19.2	17.5	16.0	14.5
14.8	16.2	17.7	19.3	21.2	117	21.5	19.6	17.8	16.3	14.8
15.0	16.5	18.0	19.7	21.6	118	22.0	19.9	18.2	16.6	15.1
15.3	16.8	18.3	20.0	22.0	119	22.4	20.3	18.5	16.9	15.4
15.5	17.1	18.6	20.4	22.4	120	22.8	20.7	18.9	17.3	15.6

* Length is measured for children below 87 cm. For children 87 cm or more, height is measured. Recumbent length is on average 0.7 cm greater than standing height; although the difference is of no importance to individual children, a correction may be made by subtracting 0.7cll lengths above 86.9 cm if standing height can not be measured

Ministry of Public Health and Sanitation & Ministry of Medical Services
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