INFLUENCE OF MATERNAL CHARACTERISTICS ON UNDER-FIVE NUTRITIONAL STATUS IN ZAMBIA

By

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THE UNIVERSITY OF ZAMBIA

LUSAKA

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DECLARATION

I, BWALYA BUPE BWALYA hereby declare that this dissertation;

(a) Represents my work;

(b) Has not previously been submitted for a degree at this or any other University; and;

(c) Does not incorporate any published work or material from another dissertation.

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Date.....

APPROVAL

The dissertation of **BWALYA BUPE BWALYA** is approved as fulfilling part of the requirements for the award of the degree of **Master of Arts in Population Studies** by the University of Zambia.

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ABSTRACT

Zambia has one of the highest prevalence levels of malnutrition among children 6 – 59 months of age. The UNICEF 1990, reports that one of the key reasons for high under-five malnutrition in Zambia is the low socio-economic status of women, among the many factors. Currently the 2007 Zambia Demographic and Health Survey indicated that among children under five 5.2 percent wasted, 14.6percent underweight and 45.4percent stunted.

Thus, the study investigated the influence that maternal characteristics play in determining the nutrition status among under five children in Zambia by utilising data from Zambians Demographic and Health Survey of 2007 (CSO, MOH, TDRC, UNZA and Macro Inc., 2007) data. Both bivariate and Multivariate (Binary Logistic Regression) analyses were used to identify the determinants of under-five malnutrition.

The analysis revealed that 5.3 percent were suffering from acute malnutrition, 15.6 percent had underweight problem and 47.1 percent from chronic malnutrition. The main contributing factors to under five malnutrition were found to be sex of the child, age in months, mother's education, number of births in the past three years, type of employment, wealth index, Body Mass Index (BMI) and Mothers Individual Dietary Diversity Score in the 24 hours prior the survey.

Therefore, this study arrives at the conclusion that, for all forms of malnutrition to be reduced to acceptable levels as per WHO recommendations, there is need for a multi-dimensional approach with specific emphasis on programs that look at income generating activities most especially for rural women in order to improve both food and nutrition security at personal and household levels. In addition, there is need for improved education that also includes appropriate child care practices for women in reproductive age groups. Moreover, in-spite the food and nutrition policy being available, there is need for a multi-sectoral food and nutrition strategic plan which will improve policy synergies among the key players in this sector.

DEDICATION

I wish to dedicate this thesis to my beautiful wife (Cynthia Mwansa Bwalya) and my daughter (Natasha Bupe Bwalya) who stood by my side encouraging me to work extra hard in ensuring that I achieve my dream. You are such jewels because even when I felt so low I always had the two shoulders to lean on and forge ahead to see this thesis to fruition.

This thesis is also dedicated to my parents. To my late Father Bupe Lazarus Bwalya I hope I have made you proud even were you are. Like you always said, "takwaba umuti wamano". To my mother Josephine Numba Mutale Bwalya you are such a blessing you have carried us through even when times seemed so hard. Without both of you I would not have lived to this day.

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LIST OF ACRONYMS

AIDS	Acquired Immuno Deficiency Syndrome
ARI	Acute Respiratory Infection
BCG	Bacillus Calmette-Guerin
BIV	Biologically Implausible Values
BMI	Body Mass Index
CED	Chronic Energy Deficiency
CEEC	Citizens Economic Empowerment Commission
CI	Confidence Interval
CSO	Central Statistical Office
DHS	Demographic Health Survey
ENA	Essential Nutrition Assessment
FAO	Food Agriculture Organisation
GAM	Global Acute Malnutrition
HAZ	Height-for-Age Z- score
HIV	Human Immuno Virus
IEC	Information Education and Communication
IYCF	Infant and Young Child Feeding
IFPRI	International Food Policy Research Institute
LBW	Low Birth Weight
MIDDS	Mothers Individual Dietary Diversity Score
MDGs	Millennium Development Goals
MOH	Ministry of Health
NCHS	National Centre for Health Statistics
NDHS	Nepal Demographic and Health Survey
NFNC	National Food and Nutrition Commission
OR	Odds Ratio
SD	Standard Deviation
SES	Social Economic Status
SPSS	Statistical Package for Social Sciences
TDRC	Tropical Diseases Research Centre
UNICEF	United Nations Children's Fund
UNZA	University of Zambia
VAD	Vitamin A Deficiency
WAZ	Weight-for-Age Z-score
WFP	World Food Program
WHZ	Weight-for-Height Z-score
WHO	World Health Organization
ZDHS	Zambia Demographic Health Survey

CHAPTER ONE
BACKGROUND

1.1 Introduction

Malnutrition constitutes a global "silent emergency," killing millions every year and sapping the long-term economic validity of nations (UNICEF, 1998). It remains a significant public health problem in many developing countries. In sub-Saharan Africa, chronic malnutrition has been a persistent problem for young children. A high percentage of children fail to reach the normal standard height-for-age; that is, they are "stunted." Hunger and malnutrition kill nearly 6 million children a year, and more people are malnourished in sub-Saharan Africa now than in the 1990s. It is also home to the vast majority of the nearly 11 million children who die before reaching the age of five, including 8 million infants (FAO, 2005). According to a study conducted by Charles and Alva in 2008, it was found that sub-Saharan African has now the world's largest rate of stunting among children under-5 children 43 percent and has shown little improvement over the last 15 years.

Statistics in the past two decades indicates that Zambia is one of the many countries in the world and sub-Saharan Africa where the levels of malnutrition are still very high among children 6 to 59 months of age and underlying up to 52% of under-5 deaths in Zambia. In addition, approximately 70 out of every 1,000 infants fall victim before they celebrate one year (UNICEF 2008). As children comprise more than half of the Zambian population, there is no doubt that malnutrition is as dangerous and pervasive as any other threat facing children today. According to the 2007 Zambia Demographic and Health Survey, the national malnutrition levels stand at (45.4 percent stunting, 5.2 percent wasting and 14.6 percent underweight).

Although there has not been a consistent trend in the decline of nutritional indices for children under 5, the results of the 2007 showed some improvements in underweight from 23 percent in 2001/02 to 15 percent in 2007. Despite some decline being noticed in the stunting levels from (46 percent in 1992, 49 percent in 1996 and 53 percent in 2001/02), it still remains high with one (1) in every two (2) children (45.4 percent) been stunted (CSO, MOH, TDRC, UNZA and Macro Inc., 2009).

Several studies carried out on the nutrition status of children under-5 tend to suggest that it is caused by a lot of factors (Zottarelli et al, 2007). World over, it has been argued that under-5 malnutrition is influenced and affected by maternal characteristics. These characteristics include: underlying social factors, such as poverty and women's status, education, food intake and micronutrient status, especially iron, Other factors include environmental factors such as smoking by pregnant and breastfeeding mothers; indoor air pollution; and infections, such as malaria (Ramakrishman, 2003).

Nutritional status of under-five children in particular is often been considered as one of the most important indicator of a household's living standard and also an important determinant of child survival (Strauss, 1990). In Zambia, very little improvement has been seen in reduction of malnutrition among children under-5. This is despite various efforts having been made by the Zambia government and its stakeholders to address the problem of malnutrition among children under-5 through improved maternal characteristics. Such efforts include: the launch of the National Food and Nutrition Policy and its implementation strategy in 1998, micronutrient and Vitamin A deficiency supplementation during child health week campaigns for children below the age of five, iron folate supplementation of pregnant women and post-partum vitamin A supplementation within two months after birth of last child (NFNC, 2008).

In addition, Information Education and Communication (IEC) campaigns have been embarked upon by the Ministry of Health and other stakeholders to try and educate the mothers on health and eating habits during antenatal clinics. Another strategy of reducing child malnutrition has been the promotion of consumption of locally produced foods (Positive Deviance Heath). The aim of all the programmes by government is to ensure the reduction of malnutrition among under-5 children in Zambia through improved maternal characteristics. It's believed that through these programmes and others such as women empowerment through the Citizen Economic Empowerment Commission (CEEC), the problem of under-5 malnutrition can be prevented and reduced in few years to come (NFNC, 2009).

The major concern of this study therefore, is that very little impact has been seen with regard to under-5 malnutrition reduction in Zambia. This is despite the government and other stakeholders accepting the important role that maternal characteristics play in the of under-5 malnutrition in the country.

1.2 Statement of the Problem

Research has shown that the prevalence of malnutrition is very low in countries were the socio-economic characteristics of women is high. For example, according to the 2007 ZDHS, it's estimated that 13 percent of children in Zambia born to women without education and those with more than secondary education are born with low birth weight. In addition, children's height-for-age below the age of six months of age has increased from 8.5 percent in 2001-02 to 18.0 percent in 2007. These results present a sad scenario as women who are educated are likely to have access to maternal information and their knowledge.

Malnutrition has been documented to underlie up to 52% of under-5 deaths in Zambia with approximately 70 out of every 1,000 infants falling victim before they celebrate one year (UNICEF 2008).

Although studies carried out earlier provide vital literature on malnutrition in Zambia, many of the studies on under-5 malnutrition in Zambia are often area specific (geographical) and have not fully explored the influence that maternal characteristics play on the nutrition status of children under-5 years of age. In addition, statistics from ZDHS surveys have been hardly analysed to see the extent to which these maternal characteristics influence under-5 malnutrition. Thus, a research on the influence of maternal characteristics is needed as most interventions in reducing under five malnutrition are tailored towards women of child bearing age.

1.3 Research Objectives

1.3.1 Overall Objective

The overall aim of this study was to examine the influence of maternal characteristics on under-5 (6-59 months of age) malnutrition in Zambia.

1.3.2 Specific Objectives

1. To establish the maternal demographic and socio-economic factors that were likely to influence the nutrition status of children 6 to 59 months of age.
2. To determine the association between the maternal and child nutrition status.
3. To examine the association between 24 hour dietary intake among women and nutrition status of children.
4. To examine the micronutrient intake among women of child bearing and nutrition status of children.
5. To assess the Infant and Young Child Feeding (IYCF) practices of women of child bearing age.
6. To determine the contribution of 6-23 months of age to the overall stunting levels in the country.

1.4 Rationale

Malnutrition is still disturbingly prevalent; globally it is the most important risk factor for illness and death, contributing to more than half of deaths in children. Geographically, more than 70 percent of malnourished children live in Asia, 26 percent in Africa and 4 percent in Latin America and the Caribbean. Globally, women and children are particularly vulnerable to malnutrition for many reasons, including age, dietary intake, biological and socio-economic factors. These women tend to have no say in decision making with regard to how resources are used in the household and have limited or no access to health care services.

Nonetheless, the causes of malnutrition probably vary in different settings, as well as over time. Policy-makers and researchers endlessly debate which of the many causes of the two birth outcomes are most important, and which areas of intervention will be most successful in reducing the problem. A better understanding of the channels through which maternal characteristics education, health and socio-economic status affects children's nutritional status can contribute to more effective policy responses to reduce malnutrition among children, which, in turn, can lead to profound and long-term benefits for stakeholders such as (individuals, households, society and the nation as a whole). Currently, in Zambia, such information is often lacking.

Thus, unreliable and inadequate decisions are made based on assumptions and unjustified conclusions. This often results in selection of inappropriate policies and programs only to discover the consequences after implementation. Therefore, this study is envisaged to fill the gap on the reduction of malnutrition most especially height-for-age and weight-for-age for children under five. Knowledge of the influence of maternal characteristics on under-5 malnutrition is therefore an important prerequisite for an enabling environment for developing effective nutritional intervention strategies for under five malnutrition reduction in Zambia. Thus, the study attempts to address some of the factors that contribute to persistent high malnutrition levels by focusing on the influential role of maternal characteristics in reducing under 5 malnutrition

and it is hoped that by conducting this study, the researcher will also contribute to the existing body of knowledge.

CHAPTER TWO

Literature Review

2.1 Observation Studies

Zambia still has the highest and most persistent levels of chronic malnutrition in the sub-Saharan Africa compared to other countries. Over the last decade, the most common conditions affecting Zambian children under five years of age have consistently been malaria, diarrhoea and pneumonia, with malnutrition underlying about half of the disease burden. While children under-five years in Zambia constitute 20% of the total population, deaths in this age group account for about 29% of all deaths each year, about 17 out of every 100 children born in Zambia never live to see their fifth birthday. Thus, a review of literature helped answer some of the questions.

Globally, a number of maternal factors have been identified to influence the high levels of child malnutrition (wasting, underweight and stunting). These factors includes socio-economic ones such as low or poor income, poverty (poor diet intakes), illiteracy levels, age at marriage, micronutrient intake (Haddad, 1999). In addition, studies have shown that often malnutrition stems from the demographic characteristics of the population (IFPRI, 2010). Numerous studies have found children in rural areas to be more likely to be stunted than their counterparts in urban areas. Stunting is also known to be more pronounced in locations where health and socio-economic conditions are poor among women of child bearing age.

Health Status and Dietary Intake

The relationship between malnutrition and health status is well documented. Infections make malnutrition worse and poor nutrition increases the severity of infectious diseases (FAO: 1997). However, a healthy body is able to resist diseases to some extent. The presence of nutrient deficiencies (malnutrition) in the body of women of child bearing age due to poor nutrition is known to reduce the body's resistance to infection as it affects the immune system, and results in poor birth outcomes such as low birth weight of children. In addition, maternal malnutrition also impairs the normal defence mechanisms of the body by making it not function properly. It reduces the ability to fight infections such as measles, upper respiratory infections, gastro

intestinal infections, malaria and HIV and AIDS. It also leads to morbidity and mortality, especially among woman and children.

Infections cause nutrient mal-absorption, metabolic alterations and reduction in food intake, vomiting and diarrhoea. Diarrhoea in women of child bearing may lead to reduced absorption of nutrients from Breast milk for children currently been breastfed. These infections if not quickly checked can lead to malnutrition.

Poverty and Infant and Young Child Feeding Practices

One of the important underlying factors of malnutrition is poverty, that is, lack of adequate food, medical facilities, and poor or uneducated mothers, resulting in unhealthy children. Increased income usually enables poor families to get better access to services (e.g. health, education). However, if the families do not spend their increased incomes on nutritious food, then malnutrition will obviously increase (Naveed et al; 2003). In a study by Nnyepi (2007), it was found that in households with perceived sufficient amounts of food for all members of the household at all times, children were 3.3 times more likely to have adequate height-of- age z-scores than children in households where food was deemed as sometimes not being enough for all household members.

In addition, many mothers, particularly in developing countries (including Zambia) and more so in the rural areas deliver their babies at home. Also as a result of cultural or other beliefs, breastfeeding starts late in many of these settings. And although majority of infants in developing countries are breastfed, exclusive breastfeeding for the recommended period of 6 months is rare. Since poor feeding practices is one of underlying determinants of child nutritional status, use of breast milk by women which provides all the necessary nutrients and anti-infective properties needed by a child in the first 6 months of life may reduce under-five malnutrition and deaths.

Research suggests that the nutrition status of children is compromised where exclusive breastfeeding is not practiced. It is possible that because of the high prevalence of malnutrition in developing countries, mothers introduce complementary food very early to prevent their children

from being malnourished. It is also possible that mothers who express anxiety about the adequacy of their milk flow might be wrongly advised about the early introduction of complementary feeding (Adeladza, 2009).

Socio-economic status

Improved socio-economic status (SES) involves changes in norms and attitudes that influence the economic decisions and nutrition-related behaviours of mothers (Adeladza, 2009). Studies have confirmed that children who belong to households from the poorest SES quintile have higher prevalence of malnutrition. Children in low-income households usually suffer from low height-for-age z-scores (stunting) compared to children in middle to upper income households. This is because the socio-economic disparities across households are likely to exacerbate the problem in poorer households and minimize it in more privileged households (Nnyepi, 2007). Hence the gradient of maternal socio-economic status remains as a crucial determinant of under-five malnutrition (Emina and Kandala, 2005).

It has also been argued that income or wealth of the mother has a positive effect on height for age of children. The effect of maternal work on the mother's own nutritional wellbeing is high and positive. This indicates that allowing mothers to work to earn their own income would substantially contribute to the reduction of child malnutrition. A study by International Food Policy Research Institute (2010) in Nigeria found that the occupation of household heads and mothers appears to be the major factor influencing the level of wasting. Also children of farming mothers were more likely to be wasted than children whose mothers were housewives ($p<0.05$). This could be due to the fact that in developing countries, mothers who leave home to farm or undertake other economic activities often leave their young children in the care of older siblings, neighbours or relatives who often do not provide optimal childcare.

The large positive effects of household wealth on child nutrition are also noteworthy, and point to poverty alleviation as a likely way in which child nutritional outcomes can be improved. This, therefore, suggests that empowering women and equipping them with skills can greatly contribute to the reduction in malnutrition among children under five.

Maternal Education and Information Education and Communication

Education of the population of any given country plays a huge role in economic well being of any given population. It also influences decision making as well as widening options for resources acquisition and control. Both aspects are important in influencing the nutritional status of a child (Kanyangwa et al., 1999). Mother's education has a large positive influence on the nutrition status of the children (Dancer and Rammohan, 2009). At the individual level, greater education for mothers contributes to new skills, beliefs, and choices about sound health and nutritional practices that directly influence the proximate determinants of child health.

Schooling provides women with knowledge about health issues, increases their power in intra-household decisions, and makes their use of healthcare services more effective. Mothers' education has a direct effect on the health of the child at birth. In addition, the most educated women are less exposed to traditional norms with negative effects on health (Adeladza, 2009). The likelihood of experiencing anthropometric failure is lower among children of educated mothers. Therefore, maternal education appears to be the determinant with the highest potential of reducing child malnutrition especially in developing countries, with households were a mother has reached secondary education usually associated with children having a lower risk of having low height-for-age.

In addition, exposure to Information, Education and Communication (IEC) materials plays a big role in influencing nutritional status of women. Education has a major impact on access to any form of information including healthy eating habits and good nutrition because exposure increases steadily with an increase in education attainment (CSO, MOH, TDRC, UNZA and Macro Inc., 2009). Other studies also show that respondents who are exposed to mass media tend to have a normal weight compared to their counter parts with no exposure to mass media (Rahman 2009). However, the findings suggest that despite the fact that healthcare services may be accessed, the disparities in household socio-economic factors overshadow the influence of the primary health care services on the nutritional status of children under 5 (Nnyepi, 2007).

Parity

Other variables of considerable theoretical importance that reflect poor nutrition status in children is parity of mother (that is, the number of children born to the woman), order of birth of the child, interval since previous birth, and household size. For example, parity among women of child bearing age (15-49) has a bearing on the nutrition status of children below the age of five as evidenced by a study conducted by the Canadian Institute for Health Information in Canada in 2009. This study found that, first born children are more likely to have low birth weight 14 percent, compared with higher order births. Like the saying goes: too early, too small. For example in Zambia, 13.8 percent of first born are likely to have a low birth weight (CSO, MOH, TDRC, UNZA and Macro Inc., 2009).

In addition, a study conducted by Adeladza in Kenya in 2009 found that small size at birth, low birth weight, and stunting all show the expected inverse relationship with mother's education. Children of mothers with at least secondary schooling are roughly half as likely to be small at birth (9.5 percent) as those born to mothers with no schooling (18 percent) ($p<0.01$). Likewise, low height-for-age (stunting) is only about half as common among children of mothers with secondary schooling or more as among children of mothers with no schooling (22 percent and 46 percent, respectively; $p<0.01$). Therefore, the observed occurrence low height-for-age z-scores in this study suggest chronic exposure to inadequate nutrition.

Environmental Factors and Substance Abuse

Environmental devastation does not just waste resources; nevertheless it is a threat to improved human development through increased production and consumption (Todaro and Smith, 2009). At household level, environmental factors are strongly and statistically significantly associated with mother's education in ways that would be expected to reduce health risks among the more highly educated (Miller and Rodgers, 2009). For example, too much alcohol consumption or drug ubuse are very harmful not only to the mother but also the baby. Studies have confirmed that smoking by mothers increases the rate of low birth weight babies, premature babies, and impaired development of the infant. In the US, maternal smoking accounts for 21% to 39% of

all low birth weight babies (less than 2,500gm), which is very significant because birth weight is the single most important determinant of neonatal and infant morbidity and mortality.

Micronutrient intake and Supplementation

Vitamin A is an essential micronutrient for the immune system and plays an important role in maintaining the epithelial tissue in the body. Severe vitamin A deficiency (VAD) can cause eye damage. VAD can also increase severity of infections such as measles and diarrhoeal diseases in children and slow recovery from illness. In Zambia, periodic dosing (usually every six months) of vitamin A supplements is one method of ensuring that children at risk do not develop VAD (CSO, MOH, TDRC, UNZA and Macro Inc., 2009).

Vitamin A supports growth, especially skeletal growth. Studies show that the proportion of acutely malnourished mothers was significantly greater among those who had not taken vitamin A and iron supplementation (Rahman, 2009). Adequate micronutrient intake by mothers does not only benefit them but precedes and extends beyond the reproductive years to optimize completion of adolescent growth and establish body nutrient reserves before pregnancy and after (Bartley et al, 2005). This is best achieved safely through a consistent balanced intake of nutrient-rich foods, including fortified foods, and nutrient supplements when necessary. With regard to children, immunization status has emerged as a significant predictor of a child's linear growth. Immunized children are less likely to be malnourished than non immunized children (Adeladza, 2009).

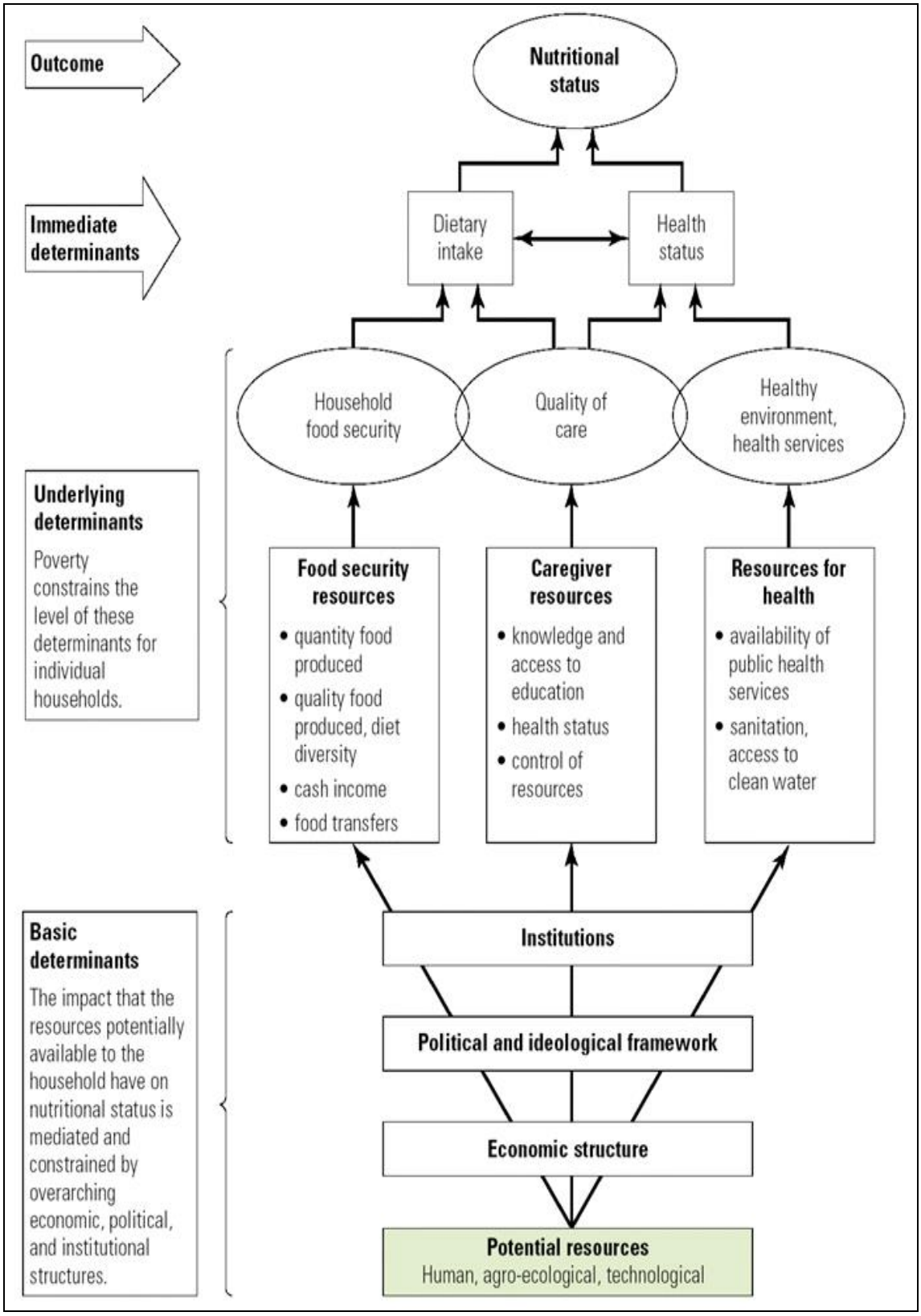
Efforts for addressing malnutrition in children below the age of five (5) in Zambia forms an important contribution to the Millennium Development Goal (MDG) for reducing child mortality (UNICEF/WFP, 2004). Malnutrition is a reasonable well-defined problem caused by factors that are potentially modifiable and the costs of preventing them are well within reach, even in poor countries like Zambia (Siza, 2008). Therefore, activities towards the achievement of the MDGs will need to ensure a healthy start in life for children by making certain that women commence pregnancy healthy and are well nourished, and go through pregnancy and childbirth safely. Furthermore, while primary health care is often standardized across populations, there may be a

need to modify the services to better address the varying needs of households by areas of residence. Malnutrition among children is therefore, an important indicator for monitoring progress towards these internationally agreed-upon goals and also ensuring the reduction in infant and child mortality and also reduction of the ever high malnutrition levels among children under five in Zambia.

2.2 Conceptual Framework

The United Nations Children's Fund (UNICEF) conceptual framework of the determinants of the nutritional status in the figure below presents a generalised understanding of how undernutrition is the outcome of specific development problems related directly to the dietary intake and the health status of the individual.

Figure1: Adapted from the UNICEF Conceptual Framework for the Determinants of Nutritional Status



Sources: Johnson 1993; Smith and Haddad 2000; and UNICEF 1990

The likelihood of a child being malnourished is based on non-maximisation of dietary intake (poor nutrition) and quality health that the mother receives before, during and after pregnancy which is very essential to the growth of the child. The quality of these immediate determinants, in turn, is determined by the underlying food security of the household in which a baby is born. Conversely, of equal importance is the availability of health services and a healthy environment and the quality of care the woman receives—that is, whether the available dietary resources for good nutrition are used effectively through appropriate caring practices. Sustained healthy and active life is only possible when these underlying determinants—food, health, and care—are each maximized. None of these is sufficient in itself, but all are necessary for good health of the woman and the baby.

The degree to which these three underlying determinants are expressed positively or negatively is a question of resources. These resources include the availability of food but extend much further to include the physical and economic access that a woman has to that food, the woman's knowledge of how to use available food and to properly care for their own health status, and the control the woman has over resources within the household that might be used to nourish herself and her children. Finally, it also depends on the level of access to information on services for maintaining health, whether preventive and curative and the presence or absence of a healthy environment to for both the mother and the child.

The framework therefore, provides a holistic and pragmatic approach to the study of nutritional status of children in developing countries (UNICEF, 1990). Furthermore, it also classifies the causes of malnutrition into 3 categories that account for the complexity of the nutritional status of children: basic causes at the societal level, underlying causes at the household/ family level, and immediate causes. While this framework has strengths, one of the major limitations is that many existing secondary data sources do not allow researchers to follow this framework in its entirety in understanding child nutrition (Zottarelli et al, 2007).

Finally, it is important to recognize from this framework that, a household or nation being food secure is not in itself sufficient to ensure the good nutritional status before, during and after

pregnancy. Despite one having reliable access to the components of a healthy diet, however, as a result of poor health or care, ignorance, or personal preferences, one may not be able or may choose not to use the foods rich in quality nutrients to which one has access.

2.3 Hypotheses

Alternative Hypothesis: Children whose mothers have better maternal demographic and socio-economic characteristics exhibit superior nutrition status than those whose mothers have poor demographic and socio-economic characteristics.

CHAPTER THREE

Research Methodology

3.1 Research Design

The Zambia Demographic Health Survey (ZDHS) has been conducted since 1992 and the last one was conducted in 2007. These are nationally representative sample surveys whose main objective is to provide information on levels and trends in fertility, childhood mortality, use of family planning methods, and maternal and child health indicators including HIV and AIDS. In addition, it is part of the national effort to monitor impacts of the countries health programs.

The ZDHS 2007 was the main sources of information that this study used for statistical analysis of the influence of maternal characteristics on under five nutritional status. However, for more details about the sample selection, size, stratification, data collection procedures, ethical considerations and pre-tests check the 2007 ZDHS.

3.2 Target Group

The study concentrated on women of child bearing age (15-49) and children below the age of five (6-59 months of age) years. This was because these groups are among the most vulnerable to malnutrition. In addition, maternal health and nutrition has got a huge influence on the nutrition status of the children below the age of five.

3.3 Inclusion criteria

- Children aged 6 – 59 months of age.
- Women aged 15 – 49 years of age.
- Children with weight and height taken.

3.4 Statistical Analysis

Analysis of data was done using the Statistical Package for Social Sciences (SPSS). However, the Essential Nutrition Assessment (ENA) for smart software was used to analyse child's nutrition status for weight-for-height, weight-for-age and height-for-age. For further statistical analysis, the z-score files where imported into SPSS version 15.0 from ENA for Smart. Independent Samples tests were performed to compare the children's differences in the means for WHZ, WAZ and HAZ and sex, type of place of residence etc.

Multivariate analysis was used to determine the correlates between women's Body Mass Index (BMI) and children's nutrition indices. In addition, Chi-Square tests where used to compare the prevalence of malnutrition of children and various maternal characteristics. For each bivariate association, close examination was done to see the significant p-values. Further, binary unconditional logistic regression models were performed to predict the likelihood of adequate weight-for-age and height-for-age z scores (WAZ and HAZ) among children under five respectively.

3.5 Dependent Variables

The Z-scores of the height-for-age, weight-for-age and weight-for-height of the child were used. Height-for-age, weight-for-age and weight-for-height more than two standard deviations below the new growth standards published by WHO in 2006 reference reflects chronic, underweight and acutely malnutrition respectively. The WHO Child Growth Standards can therefore be used to assess children all over the world, regardless of ethnicity, social and economic influences, and feeding practices. Each of the three nutritional status indicators described above was expressed in standard deviation units from the median of the Multi-centre Reference Study sample

and they serve as the best general proxy for constraints to human welfare of the poor, including dietary inadequacy, infectious diseases, and other environmental health risks.

3.6 Independent Variables

A number of broad-range independent variables were considered, including:

- Body Mass Index.
- Wealth quintile.
- Occupation of the mother.
- Household size.
- Age of mother, highest educational level, marital status, and decision making on mother's earning.
- Birth interval.
- Early initiation of breastfeeding to infants and young children, and
- Access to water and toilet facilities, child receiving vitamin A, and child based characteristics.

CHAPTER FOUR

General Findings

4.1 Data Quality

There were a total of 6 401 children whose information was collected in the 2007 ZDHS. Of which, 628 were less than 6 months of age and 780 had their age in months, date of birth, weight and height not stated as a result they were not included in the data set for this analysis. In addition to the above, of the 4, 993 children aged 6 – 59 months of age who remained, 132 of them aged 6 – 59 months of age were excluded because 23 did not have their weight and height taken; 10 did not state a reason as to why they were not measured; 53 were not present at home to have their weight or height taken; and 46 refused to have their weight and height taken.

Thus, there were only 4, 861 records available for analysis. Of these, 4 were deleted as they had extreme values leaving only 4 857 children with date of birth, age in months and both or either weight or length/height taken; and women of child bearing age 15 – 49 years. In addition, 7 records for mothers height were deleted as they were too low equal to 1.07m or less while 9 records had their weight or height not collected, leaving us with 4 841 women of child bearing age whose BMI was computed.

4.1.1Cut-offs to define outliers in the 2000 CDC Growth Charts

4.1.1.1 Data quality assessment on anthropometry data:

In the analysis of childhood height and weight data, it is necessary to identify outlier observations, or observations that are considered to be "Biologically Implausible Values (BIVs)". It has become common practice to use z-scores to define which observations are beyond the range of what one would normally expect to find in a population. Typically, these outliers are the result of data entry errors or wrong measurement, rather than from true extreme growth of the child.

4.1.1.2 WHO recommendation on outlier cut-offs (1):

For the analysis of the Weight-for-Height, Weight-for-Age and Height-for-Age Z-scores, this paper relied on the recommendations from The World Health Organization which has defined limits for acceptable data based on the 1977 NCHS/WHO growth charts. Two methods are recommended:

- Flexible exclusion range: 4 z-score units from the observed mean z-score, with a maximum height-for-age z-score of +3.0.
- Fixed exclusion range (suitable when the observed mean z-score is above –1.5):
  - Weight-for-height: <-4.0 and >+5.0
  - Weight-for-age: <-5.0 and >+5.0
  - Height-for-age: <-5.0 and >+3.0

These limits have been used in the analysis of anthropometric data worldwide. Therefore, fixed exclusion range was used for this analysis because the mean z-score for HAZ was above -1.5.

4.2 Child Nutrition Status

4.2.1 Anthropometric results: children (6 – 59 months of Age) based on WHO standards 2006

4.2.1.1 Distribution of Children's Sex and Age

The purpose of this chapter is to provide a descriptive summary of some demographic and basic nutritional status of the children. These characteristics are thought to have an influence on nutritional outcomes for the children. Among the characteristics described in this section are sex, sex ratio and age in months of the child.

Based on the recommended NCHS/WHO criteria, 4, 861 children aged 6-59 months four records (4) were deleted because they had extreme values for height and weight, leaving only 4, 857 records for children within the age group which were part of the analysis. Besides this, children who were measured while lying (6- 23 months) had a 0.1mm subtracted from their height as a child measured while lying tends to have their length increase slightly compared to the one standing (height).

Table 1 below shows that of the 4857 children aged between 6 – 59 months of age, 51.1 percent were girls while 48.9 percent were males. Disaggregated by age in months, about a quarter (25.2 percent) of the children were aged between (12 – 23 months) of age while the least age group with children was 6 – 11 months 13.0 percent. In addition, the overall mean age in months of the children was [30.70 ± 15.45 months] with no major differences when disaggregated by sex (annex 1).

Table 1: Distribution of age and sex of sample

	Boys		Girls		Total		Ratio
	N	%	n	%	n	%	Boy : Girl
Age (Months)							
6 - 11	292	46.2	340	53.8	632	13	0.9
12 - 23	602	49.3	620	50.7	1222	25.2	1.0
24 - 35	542	50.6	529	49.4	1071	22.1	1.0
36 - 47	466	47.6	514	52.4	980	20.2	0.9
48 - 59	474	49.8	478	50.2	952	19.6	1.0
Total	**2376**	**48.9**	**2481**	**51.1**	**4857**	**100**	**1.0**

4.2.1.2 Acute malnutrition based on Weight-for-Height z-scores and by sex

According to this study, a child was classified as wasted (or had Global Acute Malnutrition) if their (WHZ) was less than minus two (< -2) standard deviation from the mean zero. On the other hand, a child was considered severely and moderately wasted if their WHZ Z-score was <-3z and ≥ -3.0 to <-2.0. Records with WHZ below-4 or above 5 Z-scores from Zero (reference mean) were excluded from the analysis of weight-for-Height or wasting due to the fact that any score beyond these cut-off points is beyond what one would normally find in any given population but usually occur due to data entry errors or wrong measurements, rather than from true extreme growth of a child.

Table 2 shows that the prevalence of Global Acute Malnutrition (<-2 z-score and) was estimated to be 5.3 percent (4.7 – 6.0, 95% C.I.); moderate malnutrition (<-2 z-score and ≥-3 z-score) was 3.5 percent (3.0 – 4.1, 95% CI); and severe acute malnutrition (<-3 z-score) was also 1.8 percent (1.5 – 2.3, 95% C.I.). The table further shows that GAM was high in boys 6.1 percent (5.2 – 7.2, 95% C.I.) compared to girls 4.6 percent (3.9 – 5.5, 95% C.I.). However, the prevalence of sever acute malnutrition was almost similar in both boys 1.8 percent (1.3 – 2.4, 95% C.I.) and girls 1.9 percent (1.4 – 2.5, 95% C.I.).

Besides the above, an independent-sample t-test was conducted to compare the WHZ scores for boys and girls. Results in Annex 1 and 2 indicates that there were no significant differences in z-scores between boys (M =0.181, SD=1.374) and girls (M =0.205, SD=1.315); [t (4652) =-0.609, p=0.543] with equal variance not assumed. The magnitude of the differences in the means was very small (eta squared=0.00008). In addition, annex 5 and 6 also indicates that there were no significant differences in WHZ z-scores between urban children (M =0.184, SD=1.326) and rural children (M =0.198,

SD=1.353); [t (4690) =-0.331, p=0.740]. The magnitude of the difference was very small as well (eta squared = 0.0000213).

Table 2: Prevalence of acute malnutrition based on weight-for-height z-scores and by sex

	All	Boys	Girls
	n = 4692	n = 2291	n = 2401
Prevalence of Wasting			
Prevalence of global malnutrition (<-2 z-score)	(251) 5.3	(140) 6.1	(111) 4.6
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score)	(165) 3.5	(99) 4.3	(66) 2.7
Prevalence of severe malnutrition (<-3 z-score)	(86) 1.8	(41) 1.8	(45) 1.9

Table 3 below shows that wasting decreased as the age of the child increased with the age group 6 – 11 months having more children wasted 9.1 percent compared to 2.8 percent of the children in the age group 36 – 47 months of age.

Table 3: Prevalence of acute malnutrition by age based on weight-for-height z-scores

		Severe wasting (<-3 z-score)		Moderate wasting (≥ -3 and <-2 z-score)		wasting (<-2 z-score)		Normal (≥-2 z score)	
		n	%	n	%	n	%	n	%
Age (months)	Total no.								
6 - 11	590	19	3.2	35	5.9	54	9.1	536	90.8
12 - 23	1178	19	1.6	61	5.2	80	6.8	1098	93.2
24 - 35	1038	24	2.3	29	2.8	53	5.1	985	94.9
36 - 47	961	12	1.2	15	1.6	27	2.8	934	97.2
48 - 59	925	12	1.3	25	2.7	37	4	888	96
Total	**4692**	**86**	**1.8**	**165**	**3.5**	**251**	**5.3**	**4441**	**94.7**

4.2.1.3 Underweight based on Weight-for-Age (WAZ) z-scores and by sex

Records with WAZ below-5 or above 5 Z-scores from Zero (reference mean) were excluded from the analysis of weight-for-age or underweight. Table 4 shows that overall, the prevalence of underweight (WAZ) (<-2 z-score) was estimated to be 15.6 percent (14.6-16.6, 95% C.I.); of which 11.9 percent (11.1-12.9, 95% C.I.) were moderately underweight (<-2 z-score and ≥-3 z-score); while 3.6 percent (3.1- 4.2, 95% C.I.) were severely underweight (<-3 z-score). Disaggregated by sex, more boys were both severely underweight (3.8 percent) (3.1- 4.7, 95% C.I.) and moderately underweight (13.6 percent) (12.3-15.1, 95% C.I.) compared to girls of which 3.4

percent (2.7- 4.2, 95% C.I.) and 10.3percent (9.2-11.6, 95% C.I.) were severely and moderately underweight respectively.

An independent-sample t-test was used to compare the mean scores of WAZ between boys and girls. Results in Annex 1 and 2 indicates that there were significant differences in Z-scores between boys (M=-0.946, SD=1.190) and girls (M =-0.82, SD=1.159); [t (4847) =-3.659, p=0.000] with equal variance assumed. However, the magnitude of the differences in the means was very small (eta squared=0.003). In addition, Annex 5 and 6 also indicates that there were significant differences in WAZ z-scores between urban children (M =-0.718, SD=1.211) and rural children (M =-0.958, SD=1.151); [t (4845) =6.623, p=0.000]. The magnitude of the difference was very small as well (eta squared = 0.00899).

Table 4: Prevalence of underweight based on Weight-for-Age z-scores and by sex

	All	**Boys**	**Girls**
	n = 4692	**n = 2291**	**n = 2401**
Prevalence of underweight			
Prevalence of underweight (<-2 z-score)	(754) 15.6	(414) 17.5	(340) 13.7
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(579) 11.9	(323) 13.6	(256) 10.3
Prevalence of severe underweight (<-3 z-score)	(175) 3.6	(91) 3.8	(84) 3.4

Table 5 below shows that severe underweight (<-3 z-score) was more prevalent in the age group 24 – 35 months of age 4.8 percent while Moderate Underweight (≥ -3 and <-2 z-score) was more prevalent in the age group 12 – 23 months of age 13.1 percent respectively. The least underweight in children was recorded in those age 6 – 11 months 12.2 percent compared to those aged 12 – 23, 24 – 35 and 48 – 59 months about 16 percent.

Table 5: Prevalence of underweight by age based on Weight-for-Age z-scores

		Severe Underweight (<-3 z-score)		Moderate Underweight (≥ -3 and <-2 z-score)		Overall Underweight (<-2 z-score)		Normal (≥-2 z score)	
		n	%	n	%	n	%	n	%
Age (months)	Total no.								
6 - 11	631	21	3.3	56	8.9	77	12.2	554	87.8
12 - 23	1218	46	3.8	159	13.1	205	16.9	1013	83.2
24 - 35	1069	51	4.8	129	12.1	180	16.9	889	83.2
36 - 47	979	21	2.1	119	12.2	140	14.3	839	85.7
48 - 59	950	36	3.8	116	12.2	155	16	798	84
Total	**4847**	**175**	**3.6**	**579**	**11.9**	**754**	**15.6**	**4093**	**84.4**

4.2.1.4 Stunting based on Height-for-Age (HAZ) z-scores and by sex

Records with HAZ below-5 or above 3 Z-scores from Zero (reference mean) were excluded from the analysis of height-for-age or stunting. Table 6 below shows that overall, 47.1 percent (45.6 - 48.5, 95% C.I.) of the children aged 6 – 59 months of age in Zambia were stunted (<-2 z-score); of which 26.2 percent (25.0 – 27.5, 95% C.I.) were moderately stunted (<-2 z-score and ≥-3 z-score); and 20.9 percent (19.7 - 22.1, 95% C.I.) were severely stunted (<-3 z-score). Just like the other nutrition indicators when the data was disaggregated by sex, more boys were both severely and moderately stunted 23.7 percent (22.0 – 25.6, 95% C.I.) and 26.6 percent (24.8 – 28.4, 95% C.I.) compared to girls 18.1 percent (16.6 – 19.8, 95% C.I.) and 25.9 percent (24.1- 27.7, 95% C.I.) respectively.

In order to compare the mean scores for HAZ between boys and girls, an independent-sample t-test was used. Results in Annex 1 and 2 shows that there were significant differences in z-scores between boys (M =-1.924, SD=1.475) and girls (M =-1.714, SD=1.438); [t (4540) =-4.870, p=0.000] with equal variance assumed. The magnitude of the differences in the means was very small (eta squared=0.005). In addition, annex 5 and 6 also indicates that there were significant differences in HAZ z-scores between

urban children (M =-1.585, SD=1.435) and rural children (M =-1.923, SD=1.459); [t (4538) =7.234, p=0.000]. The magnitude of the difference was very small (eta squared = 0.0115).

Table 6: Prevalence of stunting based on Height-for-Age z-scores and by sex

	All	Boys	Girls
	n = 4540	n = 2224	n = 2316
Prevalence of stunting			
Prevalence of stunting(<-2 z-score)	(2138) 47.1	(1119) 50.3	(1019) 44.0
Prevalence of moderate stunting(<-2 z-score and >=-3 z-score)	(1190) 26.2	(591) 26.6	(599) 25.9
Prevalence of severe stunting(<-3 z-score)	(948) 20.9	(528) 23.7	(420) 18.1

Table 7 below shows that stunting increases with age rising sharply from 30.8 in the age group 6 – 11 months to 51.8 percent in the age group 12-23 months. In addition, severe stunting (<-3 z-score) was also more prevalent in the age group 12 - 23 months of age 25.4 percent while Moderate stunting (≥ -3 and <-2 z-score) was more prevalent in the age group 24 - 35 months of age (28.8 percent).

Table 7: Prevalence of stunting by age based on Height-for-Age z-scores

		Severe Stunting (<-3 z-score)		Moderate Stunting (≥ -3 and <-2 z-score)		Stunting (<-2 z-score)		Normal (≥-2 z score)	
		n	%	n	%	n	%	n	%
Age (months)	Total no.								
6 - 11	548	74	13.5	95	17.3	169	30.8	379	69.2
12 - 23	1112	282	25.4	294	26.4	576	51.8	536	48.2
24 - 35	1016	231	22.7	293	28.8	524	51.5	492	48.4
36 - 47	944	197	20.9	266	28.2	463	49.1	481	51
48 - 59	920	164	17.8	242	26.3	406	44.1	514	55.9
Total	**4540**	**948**	**20.9**	**1190**	**26.2**	**2138**	**47.1**	**2402**	**52.9**

4.2.1.5 Child's Size at Birth and Under-five Nutritional Status

This section presents results on the effects of the size at birth of the child has on the nutritional status of children under five. Birth weight is an important indicator for assessing the risk of succumbing to childhood illnesses and the likelihood of survival (CSO, ZDHS, 2007). Children with Low Birth Weight (LBW); or weight below 2 500

grams as defined by the World Health Organization (WHO) are approximately 20 times more likely to die than heavier babies. More common in developing than developed countries, a birth weight below 2 500 g contributes to a range of poor health outcomes among them malnutrition.

A chi-square test of independence shows that there was no statistically significant relationship between child's size at birth and severe wasting [x2(10, n=4684) = 9.869, p=0.452)]. Table 8 below shows that children who were reported to be very small and smaller than average at birth were more likely to be severely and moderately wasted 7.3 percent and 8.9 percent compared to those with average size 1.8 percent and 3.4 percent respectively. About 3.6 percent of children who were born larger than average were more likely to be moderately wasted 3.6 percent. On the contrary, a statistically significant relationship between child's size at birth and severe underweight [x2(20, n=4839) = 74.113, p=0.000)] was observed. Children who were reported to be very small and smaller than average at birth were more likely to be severely underweight and moderately underweight 20.1 percent and 40.6 percent compared to those with average size at birth 3.4 percent and 12.1 percent respectively.

In addition, just like underweight, a statistically significant relationship between child's size at birth and stunting [x2(10, n=4532) = 33.516, p=0.000)] was also observed. The table further shows that less than half (39.1 percent) of the children who were reported to be very small at birth were severely stunted compared to 21.2 percent who were born with average size.

Table 8: Prevalence of wasting, underweight and Stunting by size of child at birth

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥-3 - <-2 SD)	(<-2 SD)	(≥-2 SD)	Total	(<-3 SD)	(≥-3 - <-2 SD)	(<-2 SD)	(≥-2 SD)	(≥2 - 2.9 SD)	(≥3 SD)	Total	(<-3 SD)	(≥-3 & <-2 SD)	(<-2 SD)	(≥-2 SD)	Total
Size of child at birth																	
Very large	0.9	2.6	3.5	96.5	**230**	3.4	8.5	11.9	87.2	0.9	0.0	**234**	14.9	26.6	41.5	58.6	**222**
Larger than average	1.5	3.6	5.1	94.8	**1297**	2.7	10.1	12.8	85.3	1.0	0.7	**1350**	18.7	24.9	43.6	56.4	**1252**
Average	1.8	3.4	5.2	94.7	**2621**	3.4	12.1	15.5	83.2	1.1	0.2	**2699**	21.2	26.8	48.0	52.0	**2544**
Smaller than average	2.8	4.4	7.2	92.9	**434**	5.8	16.3	22.1	77.5	0.2	0.2	**449**	24.9	25.9	50.8	49.2	**417**
Very small	4.5	4.5	9.0	91.0	**67**	14.3	24.3	38.6	61.4	0.0	0.0	**70**	39.1	25.0	64.1	35.9	**64**
DK	2.9	0.0	2.9	97.1	**35**	2.7	13.5	16.2	83.8	0.0	0.0	**37**	30.3	30.3	60.6	39.4	**33**

4.3. Mothers Demographic and Socio-Economic Characteristics and Under-five Nutritional Status

Poverty is an underlying cause for diseases and deaths. It undermines maternal and child health through numerous ways, including increased risk of illness and undernutrition through insufficient diet and nutrient intake (Kinney et al, 2010). Thus, the height of a woman is associated with past socio-economic status and nutrition during childhood and adolescence. Low pre-pregnancy Body Mass Index (BMI) and short stature are risk factors for poor birth outcomes.

4.3.1 Mothers Demographic Characteristics and Under-five Nutritional Status

Table 9 shows nutrition status of children by some of the demographic characteristics of their mothers. The data below shows that wasting was high among children whose mothers were very young (15 – 19 years) 7.3 percent and those in old ages (45 – 49 years) 9.6 percent respectively. In addition, children in households with female as head of the house and with ten members or more were more likely to be moderately wasted 6.6 percent and 5.6 percent.

The table further shows that, overall, underweight among children was high in the young and older mothers. In addition, severe and moderate underweight was high among children born to mothers aged 15 -19 years 4.4 percent and 12.5 percent respectively. About five percent (4.8) of the children born to mothers aged 45 – 49 years are severely underweight; two in every ten children 16.7 percent whose mothers were aged 45 – 49 years were moderately underweight.

Further, a statistically significant relationship between Mothers type of place of residence and underweight [x2(4, n=4847) = 16.850, p=0.002)] was observed. Children born to mothers in rural areas are more likely to be severely and moderately underweight 3.9 percent and 12.8 percent compared to those born in urban areas (3.0 and 10.0 percent respectively). Four percent and 12.3 percent of children in households

headed by females are more likely to be severely and moderately underweight. Children in households with more than 12 people are also likely to be severely and moderately underweight 5.2 percent and 14.7 percent respectively.

In addition, severe and moderate stunting were high among children born to mothers aged 20 – 24 years, 22.8 percent and 28.9 percent respectively. In addition, about one third (28.6 percent) of the children born to mothers aged 45 – 49 years were moderately stunted. Just like underweight, a statistically significant relationship between mothers type of place of residence and stunting [$x2(2, n=4540) = 45.575, p=0.000$)] was observed. Children born to mothers in rural areas are more likely to be severely and moderately stunted 23.1 percent and 27.0 percent compared to urban 16.0 and 24.4 percent respectively. There were minimal differences in stunting among children in households headed by both males and females. On the contrary, the smaller the household size the higher the severe and moderate malnutrition in children 21.9 percent and 26.9 percent respectively.

Table 9 Prevalence of wasting, underweight and Stunting by Mothers Age, Type of place of Residence, Sex of the head of household and Household Size of the Mothers

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2 SD)	(≥-2 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2 SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2 SD)	(≥-2 SD)	**Total**
Age of Mothers																	
15-19	2.3	5.0	7.3	92.6	**258**	4.4	12.5	16.9	82.1	1.1	0.0	**273**	21.2	22.0	43.2	56.8	**241**
20-24	1.6	3.3	4.9	95.1	**1173**	4.1	11.0	15.1	84.0	0.7	0.2	**1208**	22.8	28.9	51.7	48.3	**1127**
25-29	1.7	3.6	5.3	94.7	**1345**	3.4	11.5	14.9	83.6	0.9	0.6	**1394**	21.1	25.3	46.4	53.6	**1313**
30-34	1.8	3.4	5.2	94.7	**988**	3.4	12.3	15.7	82.7	1.3	0.3	**1014**	19.9	25.7	45.6	54.4	**950**
35-39	1.9	3.2	5.1	94.9	**567**	3.1	11.3	14.4	84.3	1.0	0.3	**586**	18.4	25.0	43.4	56.5	**559**
40-44	2.2	2.9	5.1	95.0	**278**	3.5	16.0	19.5	79.2	1.0	0.3	**288**	21.2	26.7	47.9	52.0	**273**
45-49	3.6	6.0	9.6	90.4	**83**	4.8	16.7	21.5	77.4	1.2	0.0	**84**	16.9	28.6	45.5	54.5	**77**
Type of place of residence																	
Urban	1.8	3.1	4.9	95.0	**1461**	3.0	10.0	13.0	85.1	1.4	0.5	**1516**	16.0	24.4	40.4	59.6	**1423**
Rural	1.8	3.7	5.5	94.5	**3231**	3.9	12.8	16.7	82.3	0.8	0.2	**3331**	23.1	27.0	50.1	49.9	**3117**
Sex of Household Head																	
Male	1.7	3.4	5.1	94.9	**3890**	3.5	11.9	15.4	83.3	1.0	0.3	**4020**	20.8	26.1	46.9	53.1	**3772**
Female	2.4	4.2	6.6	93.4	**802**	4.1	12.3	16.4	82.5	0.8	0.2	**827**	21.2	26.8	48.0	52.0	**768**
House size																	
1- 3 Members	-	-	-	-	**-**	-	-	-	-	-	-	-	-	-	-	-	**-**
4 - 6 Members	2.2	3.3	5.5	94.5	**365**	2.1	11.6	13.8	85.2	1.1	0.0	**378**	21.9	25.9	47.7	52.3	**352**
7 - 9 Members	1.7	3.5	5.1	94.9	**2455**	4.1	11.6	15.7	82.9	0.9	0.4	**2533**	21.9	27.0	48.9	51.1	**2373**
≥10 Members	2.0	3.6	5.6	94.4	**1872**	3.3	12.4	15.7	83.0	1.0	0.3	**1936**	19.3	25.2	44.6	55.4	**1815**

(-) refers to no household members in that category

4.3.2 Marital Characteristics of Mothers and Under-five Nutritional Status

Table 10 below shows the nutrition status of children by mother's marital characteristics. A statistically significant relationship between mothers current marital status and wasting [x^2(10, n=4692) = 23.528, p=0.009)] was observed. Results from the table indicate that severe and moderate wasting was high among children whose mothers are widows 5.1 percent and 7.1 respectively. Four percent (3.7) of the children whose mothers had just been married once were likely to be moderately wasted. Wasting in children increased as the mothers age at first marriage increased with a statistically insignificant relationship between mothers age at first marriage and wasting [x^2(10, n=4409) = 8.583, p=0.572)] been observed. In addition, a statistically significant relationship between mothers marital duration and wasting [x^2(14, n=4692) = 37.338, p=0.001)] was observed with severe wasting been high among children whose mothers have been in a marital union for 25 – 29 years 6.3 percent.

Further, the table shows that there was no statistically significant relationship between mothers current marital status and underweight [x^2(20, n=4847) = 18.297, p=0.568)]. Severe underweight was high among children whose mothers are living together 6.9 percent, while moderate underweight was high among children whose mothers are widows 13.9 percent. About 14 percent (14.3) of the children whose mothers have been married more than once are more likely to be moderately underweight. Further, a statistically insignificant relationship between mothers age at first marriage and underweight [x^2(20, n=4556) = 14.212, p=0.820)] was observed. Additionally, severe and moderate underweight among children was high among mothers whose age at first marriage was 25 – 29 years 4.6 percent and 13.7 percent respectively. In addition, a statistically insignificant difference in mothers marital duration and underweight [x^2(28, n=4847) = 34.611, p=0.181)] was observed with moderate underweight been high

among children whose mothers have been in a marital union for 25 – 29 years were 17.6 percent.

In addition, a statistically significant relationship between mothers current marital status and stunting [x^2(10, n=4540) = 31.158, p=0.001)] was observed. Severe stunting was high among children whose mothers are not living together with their husband while moderate stunting was high among children whose mothers are widowed 39.6 percent. Nearly a quarter of the children whose mothers have been married more than once were more likely to be severely stunted. A statistically significant relationship between mothers age at first marriage and stunting [x^2(10, n=4272) = 23.909, p=0.008)] was observed. Severe stunting was high among children whose mothers' age at first marriage was less than 15 years 24.6 percent. In addition, a statistically significant relationship between mothers marital duration and stunting [x^2(14, n=4540) = 24.944, p=0.035)] was observed with severe stunting being high among children whose mothers have been in marriage for 5 – 9 years 22.5 percent while those born to mothers who have been in a marital union for 0 – 4 years, 27.3 percent were more likely to be moderately stunted.

Table 10 Prevalence of wasting, underweight and stunting by Mothers Marital Characteristics

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	**Total**
Marital Status																	
Never married	3.9	3.9	7.8	92.2	**283**	2.4	12.4	14.8	84.5	0.7	0.0	**291**	13.1	23.1	36.2	63.8	**268**
Married	1.6	3.3	4.9	95.1	**3971**	3.6	11.8	15.4	83.2	1.1	0.4	**4104**	21.0	26.3	47.3	52.6	**3852**
Living together	4.0	0.0	4.0	96.0	**25**	6.9	3.4	10.3	89.7	0.0	0.0	**29**	20.0	20.0	40.0	60.0	**25**
Widowed	5.1	7.1	12.2	87.9	**99**	5.0	13.9	18.9	81.2	0.0	0.0	**101**	18.7	39.6	58.3	41.8	**91**
Divorced	2.8	4.7	7.5	92.6	**215**	4.6	16.0	20.6	79.5	0.0	0.0	**219**	25.5	25.0	50.5	49.5	**208**
Not living together	0.0	4.0	4.0	96.0	**99**	3.9	9.7	13.6	85.4	0.0	1.0	**103**	29.2	20.8	50.0	50.0	**96**
Number of unions																	
Once	1.7	3.7	5.4	94.5	**3681**	3.7	11.5	15.2	83.5	1.1	0.3	**3801**	20.8	26.4	47.2	52.8	**3572**
More than once	1.5	2.2	3.7	96.3	**723**	3.6	14.3	17.9	80.8	0.7	0.7	**750**	24.6	26.4	51.0	49.0	**696**
Age at first marriage																	
< 15	1.9	2.3	4.2	95.8	**525**	3.9	11.6	15.5	83.9	0.6	0.0	**542**	24.6	25.3	49.9	50.1	**509**
15-19	1.7	3.6	5.3	94.7	**2943**	3.9	12.3	16.2	82.3	1.0	0.5	**3045**	22.2	26.9	49.1	50.9	**2847**
20-24	1.3	3.6	4.9	95.1	**798**	2.7	10.5	13.2	85.5	1.2	0.1	**821**	17.6	24.7	42.3	57.7	**778**
25-29	3.2	4.8	8.0	92.1	**126**	4.6	13.7	18.3	80.9	0.8	0.0	**131**	16.5	29.8	46.3	53.7	**121**
30-34	6.7	6.7	13.4	86.7	**15**	0.0	13.3	13.3	86.7	0.0	0.0	**15**	0.0	26.7	26.7	73.3	**15**
35-39	0.0	0.0	0.0	100.0	**2**	0.0	0.0	0.0	100.0	0.0	0.0	**2**	0.0	0.0	0.0	100.0	**2**
Marital duration																	
Never married	3.9	3.9	7.8	92.2	**283**	2.4	12.4	14.8	84.5	0.7	0.0	**291**	13.1	23.1	36.2	63.8	**268**
0 - 4	1.8	4.9	6.7	93.3	**775**	4.5	11.4	15.9	83.1	1.0	0.0	**804**	21.8	27.3	49.1	50.9	**752**
5 - 9	1.7	2.9	4.6	95.4	**1398**	3.9	10.9	14.8	83.8	0.7	0.7	**1448**	22.5	26.4	48.9	51.0	**1344**
10 - 14	1.1	3.3	4.4	95.6	**968**	3.6	12.3	15.9	82.6	1.3	0.2	**994**	21.4	25.9	47.3	52.7	**935**
15-19	1.2	3.9	5.1	94.9	**664**	2.3	13.0	15.3	83.5	1.0	0.1	**686**	19.7	26.6	46.3	53.8	**651**
20-24	1.6	2.9	4.5	95.6	**383**	3.8	10.6	14.4	83.3	1.5	0.8	**396**	20.4	24.7	45.1	54.9	**377**
25-29	6.3	2.8	9.1	90.9	**176**	4.4	17.6	22.0	77.5	0.5	0.0	**182**	21.8	25.9	47.7	52.4	**170**
30+	2.2	2.2	4.4	95.6	**45**	2.2	17.4	19.6	80.4	0.0	0.0	**46**	9.3	37.2	46.5	53.5	**43**

4.3.3 Mothers Current Fertility Levels and Trends and Under-five Nutritional Status

Table 11 below shows the nutrition status of children by mother's current fertility levels and trends. Results from the table indicate that severe wasting was high among children whose mothers' age at first birth was less than 15 years 3.0 percent. There was no statistically significant relationship between mothers births in the past year and a child being wasted [x2(6, n=4692) = 12.124, p=0.059)]. It is therefore evident that both severe and moderate wasting in children increasing as the mothers births in the past year increased. A statistically significant relationship between mothers births in the past three years and a child being wasted [x2(8, n=4692) = 40.473, p=0.000)] was observed. Five percent (5.3) of children whose mothers had given birth to three children in the past three years were more likely to be wasted. There was however, no significant relationship between mothers number of births in the past five years and a child being wasted [x2(8, n=4692) = 6.745, p=0.554)]; however, one in every ten children whose mothers gave birth to 4 children in the past five years was likely to be wasted.

Underweight was high among children whose mothers' age at first birth was less than 15 years (6.0 percent). About two in every ten children whose mothers were aged 30 – 34 years were more likely to be moderately underweight. A statistically significant relationship between the number of children a mother gave birth to and a child been underweight [x2(8, n=4847) = 20.992, p=0.007)] was observed with children whose mothers had given birth to about 7 – 12 children being more likely to be moderately underweight 13.9 percent. Furthermore, there was a statistically significant relationship between mothers births in the past year and a child being underweight [x2(12, n=4847) = 24.047, p=0.020)]. Results also show that children whose mothers had two children in the past one year prior the survey were likely to be severely and moderately underweight, 15.6 percent and 18.8 percent respectively. Results further reveals that,

there was a statistically significance relationship between mothers births in the past three years and children being underweight [x2(16, n=4847) = 45.056, p=0.000)] with about 13 percent (12.6) of the children born to mothers who gave birth to three children in the past three years were more likely to be moderately underweight.

In addition, a statistically insignificant difference in mothers births in the past five years and a child being underweight [x2(16, n=4847) = 20.939, p=0.181)] was observed. About one in every ten children whose mothers gave birth to three children in the past five years was likely to be underweight.

Results further show that, severe and moderate stunting was high among children whose mothers' age at first birth was less than 30 – 34 years 26.3 and 31.6 percent respectively. Children whose mothers had given birth to 7 – 12 children were more likely to be severely stunted 21.8 percent. No statistically significant relationship between mothers births in the past year and a child being stunted [x2(6, n=4540) = 17.700, p=0.007)] was reported with both severe and moderate stunting in children increasing as the mothers number of births in the past year increased. Conversely, there was a statistically significant difference between mothers number of births in the past three years and a child being stunted [x2(6, n=4540) = 26.767, p<0.001)]. It is also evident that both severe and moderate stunting were high among children whose mothers had given birth to 3 children in the past three years prior to the survey 29.4 percent and 41.2 percent respectively (p <0.01).

Besides the above, there was a statistically significant relationship between mothers births in the past five years and a child being stunted [x2(8, n=4540) = 28.336, p=0.01)]; with about three in every ten children whose mothers gave birth to 3 children in the past five years were likely to be severely and moderately stunted.

Table 11 Prevalence of wasting, underweight and stunting by Mothers current Fertility Levels and Trends

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	**Total**
Age of respondent at 1st birth																	
< 15	3	2	5	95	**202**	6	12	18	79.2	1.9	0.9	**216**	21.5	26.7	48.2	51.8	**191**
15-19	1.8	3.6	5.4	94.6	**3180**	3.5	12.2	15.7	83.2	0.8	0.2	**3279**	21.8	25.6	47.4	52.6	**3077**
20-24	1.7	3.5	5.2	94.9	**1150**	3.5	11.4	14.9	83.6	1.1	0.4	**1187**	19.2	28.1	47.3	52.7	**1119**
25-29	2.9	4.3	7.2	92.8	**139**	3.5	8.3	11.8	85.4	2.1	0.7	**144**	12.1	22	34.1	65.9	**132**
30-34	0	0	0	100	**19**	0	21.1	21.1	78.9	0	0	**19**	26.3	31.6	57.9	42.1	**19**
35-39	0	0	0	100	**2**	0	50	50	50	0	0	**2**	0	50	50	50	**2**
Total Children Ever Born																	
≤ 6	1.7	3.5	5.2	94.8	**3847**	3.6	11.5	15.1	83.6	0.9	0.4	**3975**	20.7	26.4	47.1	52.9	**3718**
6 - 12	2.5	3.4	5.9	94.1	**844**	3.6	13.9	17.5	80.9	1.5	0.1	**870**	21.8	25.2	47	52.9	**820**
≥13	0	0	0	100	**1**	50	0	50	50	0	0	**2**	0	50	50	50	**2**
Births in past year																	
0	1.6	3.2	4.8	95.2	**3041**	3.9	12.1	16	82.8	0.8	0.4	**3131**	21.3	27.6	48.9	51.2	**2954**
1	2.2	4	6.2	93.8	**1619**	2.9	11.5	14.4	84	1.4	0.2	**1683**	20	23.5	43.5	56.5	**1555**
2	6.5	9.7	16.2	83.9	**31**	15.6	18.8	34.4	65.6	0	0	**32**	26.7	33.3	60	40	**30**
3	0	0	0	100	**1**	0	0	0	100	0	0	**1**	0	100	100	0	**1**
Births in last three years																	
0	1.2	2.7	3.9	96.2	**601**	2.9	12.2	15.1	84	0.5	0.3	**613**	17.6	27.5	45.1	54.9	**590**
1	1.8	3.6	5.4	94.6	**3344**	3.3	11.8	15.1	83.6	1	0.3	**3465**	20.2	26	46.2	53.8	**3230**
2	2.5	3.7	6.2	93.8	**725**	5.4	12.6	18	80.6	1.1	0.4	**746**	26.7	25.7	52.4	47.6	**700**
3	0	5.3	5.3	94.7	**19**	20	5	25	65	10	0	**20**	29.4	41.2	70.6	29.4	**17**
4	0	66.7	66.7	33.3	**3**	0	0	0	100	0	0	**3**	0	0	0	100	**3**
Births in last five years																	
1	2.1	3.6	5.7	94	**1661**	3.1	11.4	14.5	83.8	1.2	0.4	**1719**	18.8	25.8	44.6	55.5	**1605**
2	1.6	3.4	5	95	**2530**	3.4	12.2	15.6	83.4	0.8	0.3	**2613**	21.4	26.2	47.6	52.4	**2453**
3	2.1	3.6	5.7	94	**469**	6.6	12.6	19.2	79.3	1	0.4	**484**	26.1	27.9	54	46	**452**
4	3.4	10.3	13.7	86	**29**	3.6	10.7	14.3	82.1	3.6	0	**28**	11.1	18.5	29.6	70.4	**27**
5	0	0	0	100	**3**	0	0	0	100	0	0	**3**	0	100	100	0	**3**

4.3.4 Mothers Birth Order and Interval and Under Five Nutritional Status

Table 12 below shows that two in every ten children whose mothers previous birth interval was less than two were likely to be underweight compared to about one in every ten children whose mothers previous birth interval was 3 years. In addition, stunting in children decreased as the mother's previous birth interval increased.

Table 12: Percentage Distribution of wasting, underweight and stunting by mothers birth order and interval

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3)	(≥-3 & <-2)	(<-2)	(≥-2)	Total	(<-3)	(≥-3 & <-2)	(<-2)	(≥-2)	(≥2 - 2.9)	(≥3)	Total	(<-3)	(≥-3 & <-2)	(<-2)	(≥-2)	Total
Birth Order																	
1	2.3	3.4	5.7	94.3	**882**	3.0	11.6	14.5	84.5	1.0	0.0	**909**	19.6	26.2	45.8	54.2	**851**
2-3	1.4	3.4	4.9	95.1	**1664**	3.9	11.3	15.2	83.4	0.8	0.6	**1724**	22.2	27.0	49.2	50.8	**1611**
4-6	1.6	3.5	5.2	94.8	**1467**	3.4	12.5	15.9	82.7	1.1	0.3	**1513**	20.0	25.7	45.6	54.4	**1422**
7+	2.7	3.8	6.5	93.5	**679**	4.0	13.0	17.0	81.6	1.3	0.1	**701**	21.2	25.5	46.6	53.4	**656**
Previous Birth Interval																	
<2 Years	1.8	3.1	4.9	95.1	**552**	5.3	12.7	17.9	80.8	0.7	0.5	**569**	24.5	27.0	51.5	48.5	**518**
2 Years	1.7	3.3	5.0	95.0	**1492**	3.9	12.1	16.0	83.2	0.6	0.1	**1540**	22.0	27.3	49.2	50.8	**1448**
3 Years	1.5	4.7	6.2	93.8	**941**	3.8	11.0	14.8	83.9	0.8	0.5	**973**	19.8	24.1	43.9	56.1	**916**
4+ Years	2.0	2.9	4.9	95.1	**819**	2.4	12.7	15.1	82.3	1.9	0.7	**849**	19.1	26.2	45.3	54.7	**801**

4.3.5 Mothers Economic Characteristics and Under-five Nutritional Status

Women's economic status increases household income, with consequent benefit to household nutrition in general and the woman's nutritional status in particular. Employment may increase women's status and power, and may bolster a woman's preference to spend her earnings on health and nutrition. Though employed, women without control over their income and decision making authority within the household are deprived of economic and social power and the ability to take actions that will benefit their own well-being (Girma et al, 2002).

Studies in Africa have indicated that, at similar levels of income, households in which women have a greater control over their income are more likely to be food secure (Kennedy and Haddad, 1991). Therefore, if the woman is employed and able to make

decisions that her income is going to be spent on better medical health services and good quality food high in nutrients eventually that will have a ripple effect even on the children under five.

There was no statistically significant difference between mothers type of employment and a child being [x^2 (4, n=2826) =4.061=0.398]. Table 17 also shows that, 6 percent and 5 percent of the children whose mothers were seasonally and occasionally employed were likely to be wasted. Eight percent of the children whose mother's occupation was skilled manual are wasted. About six percent and five percent of the children whose mothers partner does not bring the money earned or did not know where their partners took the earnings were likely to be wasted. Children whose mothers' wealth indexes were (poorest, poorer and richer) were likely to be wasted (6.7 percent, 5.5 percent and 5.2 percent) compared to those whose mothers' wealth indexes were middle and richest about 4percent.

A statistically significant difference between mothers employment and a child being underweight was observed (p=0.017), with two in every ten children whose mothers were seasonally or occasionally employed being more likely to be underweight. Mothers type of occupation was also related to child underweight (p=0.013). Two in every ten children whose mothers occupation is clerical or skilled manual been more likely to be underweight; two in every ten children whose mothers' earnings were in kind only were moderately underweight compared to one in every ten among those whose mothers are paid cash only. About one in every ten children whose mothers earn more than/less than/about the same as partner or were moderately underweight. Children whose mothers were in the poorest, poorer or middle index were likely to be underweight compared to those in richer and richest.

Mothers type of employment was also statistically significantly related to the child being stunted [x^2 (4, n=2743) =13.720=0.008]. About two in every ten and three in every ten children whose mothers were seasonally employed were severely and moderately stunted (23.4 percent and 26.3 percent) compared to those who are employed all year round, 18.1 percent and 25.0 percent respectively. A statistically significant relationship between mothers occupation and the child been stunted [x^2 (16, n=4530) =32.836=0.008] was observed. About 25 percent of the children whose mothers occupation was agricultural employee were more likely to be severely stunted compared to 11.9 percent of the children whose mothers were professionals, technicians or managers. On the other hand, moderate stunting among children was high among those whose mothers were self employed in agriculture sector 27.0 percent. In addition, there was a statistically significant relationship between the mothers wealth index and a child being stunted [x^2 (8, n=4540) =86.468=0.000]. It is also evident from the table that, mothers in the poorest wealth quintile had moderately stunted children (28.2 percent) compared to those in the richest wealth quintile (21.3 percent).

Table 13: Prevalence of wasting, underweight and stunting by Mothers type of employment, Occupation, Earnings for work, Earns more than partner and Wealth Index

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< - 2 SD)	(≥-2 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< - 2 SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< - 2 SD)	(≥-2 SD)	**Total**
Type of Employment																	
All year	1.8	2.8	4.6	95.3	**1136**	3.4	11.3	14.7	83.9	0.9	0.5	**1172**	18.1	25	43.1	56.8	**1110**
Seasonal	2	4	6	94	**1360**	3.9	11.7	15.6	83.8	0.6	0	**1398**	23.4	26.3	49.7	50.3	**1316**
Occasional	1.2	4.2	5.4	94.5	**330**	4	14.4	18.4	78.7	2	0.9	**348**	22.7	25.6	48.3	51.7	**317**
Occupation																	
Not working	1.8	3.4	5.2	94.8	**1860**	3.4	12.1	15.5	83.1	1	0.4	**1923**	20.4	26.8	47.2	52.8	**1791**
Prof., Tech., Manager.	1.5	2.9	4.4	95.6	**68**	1.4	7.1	8.5	88.6	2.9	0	**70**	11.9	16.4	28.3	71.6	**67**
Clerical	0	4.2	4.2	95.8	**24**	0	20	20	72	4	4	**25**	12	28	40	60	**25**
Sales	1.8	2.7	4.5	95.5	**785**	2.5	9.2	11.7	86.6	1	0.7	**813**	17.2	24.8	42	58	**767**
Agric-self employed	2.1	3.8	5.9	94	**1304**	4.4	12.3	16.7	82.5	0.7	0.1	**1343**	23.6	27	50.6	49.4	**1250**
Agric-employee	0.8	4.7	5.5	94.5	**381**	5.4	13.8	19.2	79.7	0.8	0.3	**390**	24.8	25.6	50.4	49.6	**371**
Services	0	1.2	1.2	98.8	**82**	1.2	12.9	14.1	84.7	1.2	0	**85**	20.5	25.3	45.8	54.2	**83**
Skilled manual	3.4	4.6	8	92	**175**	3.8	16.8	20.6	78.4	1.1	0	**185**	19.7	25.4	45.1	54.9	**173**
Unskilled manual	0	33.3	33.3	66.7	**3**	0	0	0	100	0	0	**3**	0	33.3	33.3	66.7	**3**
Earning for Work																	
Not paid	2.2	4.5	6.7	93.3	**1096**	4.7	12.1	16.8	82.6	0.5	0.1	**1137**	22.7	24	46.7	53.3	**1057**
Cash only	1.5	3	4.5	95.5	**1312**	3	10.8	13.8	84.4	1.3	0.6	**1353**	18.6	26.6	45.2	54.7	**1288**
Cash & in kind	2	4	6	94	**351**	3.9	14.2	18.1	81.1	0.8	0	**359**	23.6	28.3	51.9	48.1	**339**
In kind only	1.4	0	1.4	98.6	**73**	2.7	16	18.7	80	1.3	0	**75**	33.8	26.2	60	40	**65**
Earns more than partner																	
More than him	2.9	1.8	4.7	95.3	**171**	4.6	9.7	14.3	84	1.1	0.6	**175**	21.6	21	42.6	57.5	**167**
Less than him	1.9	3.2	5.1	94.9	**961**	2.7	11.6	14.3	83.5	1.6	0.5	**989**	20.4	29	49.4	50.6	**936**
About the same	0.5	3.5	4	96	**200**	5.3	9.7	15	84.1	0.5	0.5	**207**	17.9	21.9	39.8	60.2	**196**
Partner doesn't bring in money	0	5.9	5.9	94.1	**51**	3.8	11.3	15.1	83	1.9	0	**53**	23.1	25	48.1	51.9	**52**
Don't know	0	5.3	5.3	94.7	**19**	15.8	5.3	21.1	78.9	0	0	**19**	21.1	31.6	52.7	47.4	**19**
Wealth quintile																	
Poorest	2.7	4	6.7	93.3	**1043**	3.7	14.3	18	81.3	0.6	0.1	**1077**	21.2	28.2	49.4	50.6	**1001**
Poorer	1.7	3.8	5.5	94.5	**1033**	4.4	12.8	17.2	81.6	0.7	0.5	**1070**	26.4	26.7	53.1	46.9	**997**
Middle	1.4	3.1	4.5	95.5	**1092**	3.8	13.7	17.5	81	1.3	0.4	**1120**	23.8	27	50.8	49.1	**1054**
Richer	2.1	3.1	5.2	94.8	**954**	3.7	8.4	12.1	86.2	1.2	0.5	**999**	16.2	25.6	41.8	58.2	**933**
Richest	0.9	3.5	4.4	95.6	**570**	1.5	8.8	10.3	88.3	1.2	0.2	**581**	12.8	21.3	34.1	65.9	**555**

4.3.6 Water sources and Under-five Nutritional Status

Lack of safe water, sanitation, proper nutrition, essential health services and awareness about effective interventions make the poor especially vulnerable to acute diarrhoeal diseases. Poor women and children are particularly affected by lack of access to safe water supply because they have to fetch and carry water from remote places. As a result, large outbreaks of acute watery diarrhoea and deaths usually affect these most vulnerable groups in society. With limited water, these groups tend not to drink and cleanse adequately, thus promoting water-washed and waterborne diseases. Therefore, adequate supply of safe water and improved sanitation as well as community, household and good personal hygiene practices can tangibly reduce the disease burden among children and women, thus reducing the risks of diarrhoeal and malnutrition.

Table 14 shows that, there was no relationship between mothers household water source and the child being wasted ($p>0.05$). However, close examination of the table reveals that, more than five percent of the children whose mothers household water sources are piped into dwelling, piped to yard/plot, protected well and others sources were likely to be wasted compared to 4.1 percent among those whose mothers households uses River/dam/lake/ponds/stream/canal/irrigation channel. Further, there was no statistically significant difference between the time taken for mothers households to reach the water source and the child being wasted ($p>0.05$). However, about one in every ten children whose mother's house didn't know how long it took to reach the water source being likely to be moderately wasted. In addition, 6.7 percent of the children whose mother's household has no toilet facility were severely wasted compared to 4.7 percent of those whose mothers' households used flush or VIP toilets.

Children whose mothers households water source was a protected well were likely to be moderately underweight (14.5 percent) compared to those whose mothers

households water source were piped into dwelling (9.8 percent), piped to yard/plot (10.0 percent) and public tap/standpipe respectively. A chi-square test of independence shows that there was no relationship between mothers household water source and a child being underweight ($p=0.049$). In addition, there was no statistically significant relationship between the time taken for mothers household to the water source and the child been underweight ($p>0.05$). However, about two in every ten children whose mother did not know how long it took to reach the water source compared to one in ten among those whose water source was on their premises. Four (4.2) percent and 13.2 percent of the children whose mothers households has no toilet facility are severely and moderately underweight compared to1.0 percent and 10.4 percent whose households use flush toilets.

Mothers water source and child stunting were statistically related ($p<0.01$). Children whose mothers households' water source was the river/dam/lake/ponds/stream/canal/irrigation channel were likely to be severely stunted (27.1 percent) compared to those whose mothers water source was piped into dwelling (11.6 percent). In addition, there was a statistically significant relationship between the time taken for the mother to reach the water source and a child being stunted ($P<0.01$). About three in every ten children whose mothers took less than 30 minutes/60-120 minutes or didn't know how long it took to reach the water source were likely to be moderately stunted. There was a statistically significant relationship between the time taken by the mothers household to reach the water source and a child being stunted. One third of the children whose mothers' households use VIP toilets, pit latrine without slab, pit latrine with slab and no facility are moderately stunted compared to 20.6 percent of the children whose houses use flush toilets.

Table 14: Prevalence of wasting, underweight and stunting by Source of Drinking Water, Time to get to water sources and Type of Toilet facility used

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< - 2 SD)	(≥-2 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< - 2 SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< - 2 SD)	(≥-2 SD)	Total
Source of drinking water																	
Piped into dwelling	1.1	3.9	5.0	95.0	**180**	2.2	9.8	12.0	86.3	1.6	0.0	**183**	11.6	20.2	31.8	68.2	**173**
Piped to yard/plot	1.7	3.6	5.3	94.7	**303**	2.3	10.0	12.3	86.7	0.6	0.3	**309**	16.8	20.5	37.3	62.7	**292**
Public tap/standpipe	1.8	2.8	4.6	95.4	**614**	2.5	9.0	11.5	85.8	1.7	0.9	**642**	15.9	26.1	42.0	58.0	**602**
Protected well	3.4	4.1	7.5	92.5	**610**	4.6	14.5	19.1	80.4	0.3	0.2	**634**	23.1	28.2	51.3	48.7	**585**
Unprotected well	1.6	3.8	5.4	94.6	**1806**	3.1	12.0	15.1	83.7	1.0	0.2	**1861**	20.3	26.5	46.8	53.2	**1753**
River/dam/lake/ponds/stream/canal/irrigation channel	1.6	2.5	4.1	95.9	**948**	4.8	13.1	17.9	80.8	0.9	0.4	**982**	27.1	27.1	54.2	45.9	**905**
Tanker truck	0.0	0.0	0.0	100.0	**3**	0.0	0.0	0.0	100.0	0.0	0.0	**3**	66.7	33.3	100.0	0.0	**3**
Bottled water	0.0	0.0	0.0	100.0	**3**	0.0	0.0	0.0	100.0	0.0	0.0	**3**	0.0	0.0	0.0	100.0	**3**
Other	1.5	4.6	6.1	93.8	**130**	6.1	11.4	17.5	82.6	0.0	0.0	**132**	21.5	28.5	50.0	50.0	**130**
Time to get to water source																	
< 30 Min	2.2	3.4	5.6	94.4	**2635**	3.3	12.0	15.3	83.5	1.0	0.3	**2744**	20.6	27.3	47.9	52.1	**2552**
30 - 60 Min	1.4	3.9	5.3	94.6	**763**	4.1	14.1	18.2	80.2	1.0	0.5	**779**	21.0	26.2	47.2	52.8	**737**
60 - 120 Min	1.2	3.7	4.9	95.0	**402**	5.4	12.2	17.6	81.0	1.0	0.5	**411**	29.0	24.1	53.1	46.9	**386**
> 120 Min	0.0	0.0	0.0	100.0	**4**	0.0	0.0	0.0	100.0	0.0	0.0	**4**	25.0	0.0	25.0	75.0	**4**
On premises	1.2	3.0	4.2	95.8	**762**	2.6	9.5	12.1	86.9	0.9	0.1	**779**	17.1	23.3	40.4	59.6	**735**
Don't know	3.6	7.1	10.7	89.3	**28**	13.8	17.2	31.0	69.0	0.0	0.0	**29**	37.9	31.0	68.9	31.0	**29**
Type of Toilet Facility																	
Flush Toilets (to sewer, septic tank, pit latrine, somewhere else, Don't Know)	1.0	3.7	4.7	95.3	**365**	1.0	10.4	11.4	87.6	1.0	0.0	**386**	13.0	20.6	33.6	66.4	**369**
Pit latrine - ventilated improved pit (VIP)	0.9	2.8	3.7	96.3	**313**	3.3	11.4	14.7	84.4	0.9	0.0	**334**	18.7	26.2	44.9	55.1	**321**
Pit latrine - with slab	1.5	3.7	5.2	94.8	**567**	2.9	8.7	11.6	86.5	1.4	0.5	**622**	17.7	25.7	43.4	56.6	**588**
Pit latrine - without slab / open pit	1.8	3.0	4.8	95.2	**1940**	3.8	12.5	16.3	82.0	1.1	0.5	**2109**	23.1	27.2	50.3	49.7	**1965**
No facility/bush/field	2.6	4.1	6.7	93.3	**1144**	4.2	13.2	17.4	82.0	0.5	0.1	**1268**	21.9	26.0	47.9	52.1	**1177**
Composting toilet	0.0	0.0	0.0	100.0	**1**	0.0	100.0	100.0	0.0	0.0	0.0	**1**	0.0	100.0	100.0	0.0	**1**
Hanging toilet/latrine	0.0	0.0	0.0	100.0	**2**	0.0	0.0	0.0	100.0	0.0	0.0	**2**	0.0	100.0	100.0	0.0	**2**
Other	0.0	5.3	5.3	94.7	**18**	4.5	9.1	13.6	77.3	4.5	4.5	**22**	33.3	38.9	72.2	27.8	**18**

4.3.7 Mothers Smoking and Drinking Habits and Under-five Nutritional Status

It is well established from studies in adults that smoking is associated with dietary quality, with smokers tending to have diets that conform less closely to guidelines on healthy eating than non-smokers (Rodgers et al, 2003). Passive smoking and alcohol consumption have also been shown to be associated with dietary quality (Thornton et al, 1994). Children whose mothers smokes or drinks alcohol are at increased risk of a number of childhood health conditions such as ARI, low-birth weight and poor nutritional status due to diverging of the much needed resources to purchasing quality foods for their children to buying cigarettes and alcohol. In addition, smoking mothers are less likely to breastfeed their babies (Rodgers, et al, 1997) and tend to introduce solids into the diets of their babies earlier. Children of smoking and drinking mothers consumed a diet that conformed less closely to current recommendations on healthy eating than did the children of non-smokers and drunkards (Rodgers et al, 2003). Therefore, this section looks at how maternal smoking and alcohol consumption are associated with under five nutritional status.

According to table 15, there was no statistically significant relationship between mothers smoking cigarettes and the child being wasted ($p>0.05$). Children whose mothers do smoke are likely to be wasted 5.3 percent compared to those whose mothers smoke 3.7 percent. About two in every ten children whose mothers smoke cigarettes, pipe or uses snuff are likely to be moderately underweight compared to one in every ten whose mothers do smoke cigarettes, pipe or use snuff. Children born to mothers who smokes pipe are likely to be severely underweight compared to 3.6 percent whose mothers do not smoke pipe. About one third of the children whose mothers' smoke pipe were likely to be severely stunted compared to about two in every ten children whose mothers do not smoke pipe.

In addition, there are small differences noted in terms of a child being both severely and moderately underweight or stunted if the mother drinks alcohol or not. However, the relationship was not statistically significant ($p > 0.05$).

Table 15 Prevalence of wasting, underweight and stunting by mothers smoking and drinking status

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< - 2 SD)	(≥-2 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< - 2 SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< - 2 SD)	(≥-2 SD)	Total
Smokes cigarettes																	
No	1.8	3.5	5.3	94.6	**4659**	3.6	11.9	15.5	83.2	0.9	0.3	**4812**	20.9	26.2	47.1	52.8	**4510**
Yes	0.0	3.7	3.7	96.3	**27**	0.0	17.2	17.2	72.4	10.3	0.0	**29**	16.0	20.0	36.0	64.0	**25**
Smokes pipe																	
No	1.8	3.5	5.3	94.6	**4676**	3.6	11.9	15.5	83.2	1.0	0.3	**4831**	20.9	26.2	47.1	52.9	**4526**
Yes	0.0	0.0	0.0	100.0	**8**	12.5	25.0	37.5	62.5	0.0	0.0	**8**	28.6	28.6	57.2	42.9	**7**
Chewing tobacco																	
No	1.8	3.5	5.3	94.7	**4662**	3.6	11.9	15.5	83.2	0.9	0.3	**4816**	20.9	26.2	47.1	52.9	**4512**
Yes	9.1	4.5	13.6	86.4	**22**	4.3	13.0	17.3	78.3	4.3	0.0	**23**	14.3	19.0	33.3	66.7	**21**
Uses snuff																	
No	1.9	3.5	5.4	94.6	**4642**	3.6	11.9	15.5	83.2	0.9	0.3	**4797**	21.0	26.2	47.2	52.9	**4493**
Yes	0.0	4.8	4.8	95.2	**42**	0.0	16.7	16.7	81.0	2.4	0.0	**42**	10.0	30.0	40.0	60.0	**40**
Smokes other																	
No	1.8	3.5	5.3	94.6	**4683**	3.6	11.9	15.5	83.2	1.0	0.3	**4838**	20.9	26.2	47.1	52.9	**4532**
Yes	0.0	0.0	0.0	100.0	**1**	0.0	0.0	0.0	100.0	0.0	0.0	**1**	0.0	0.0	0.0	100.0	**1**
Drink alcohol																	
No	1.8	3.4	5.2	94.8	**4244**	3.7	11.9	15.6	83.2	0.9	0.4	**4383**	21.2	26.3	47.5	52.5	**4112**
Yes	2.1	4.4	6.5	93.5	**428**	3.2	11.9	15.1	83.1	1.8	0.0	**444**	18.0	25.1	43.1	56.8	**410**

4.3.8 Maternal Education, Information and Communication and Under-five Nutritional Status

Table 16 below shows that, children whose mother had no education at all were more likely to be severely and moderately wasted 2.7 percent and 4.2 percent respectively. About 4 percent of the children whose mothers could not read at all and have never participated in a literacy program outside of primary education were likely to be moderately wasted.

There was a statistically significant relationship between mothers educational level attained and the child being underweight [x^2(12, n=4847) = 48.994, p=0.000)]. The table below further shows that, the lower the mothers level of education the higher the chances of the child being underweight. In addition, a chi square test of independence shows a statistically significant difference between mothers literacy levels and the child being underweight [x^2(12, n=4847) = 48.994, p=0.000)]. One in every ten children whose mothers could not read at all was likely to be moderately underweight 13.7 percent. Further, 13.3 percent of the children whose mother has never participated in a literacy program outside of primary were likely to be moderately underweight.

Stunting in children was significantly related with the educational level that the mother to the child has attained [x^2(6, n=4540) = 55.387, p=0.000)]. In addition, about three in every ten children whose mothers are only able to read only parts of sentence and those who have never participated in a literacy program outside of primary are moderately stunted.

Table 16: Prevalence of wasting, underweight and Stunting by Mothers Education and Literacy Level

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	Total
Educational Level Attained																	
No education	2.7	4.2	6.9	93.1	**620**	5.9	13.7	19.6	78.5	1.4	0.5	**648**	20.6	27.0	47.6	52.4	**593**
Primary	1.8	3.3	5.1	94.9	**2950**	3.8	12.9	16.7	82.2	0.9	0.3	**3049**	23.5	26.4	49.9	50.1	**2852**
Secondary	1.6	3.6	5.2	94.8	**1026**	2.0	8.5	10.5	88.2	0.9	0.5	**1051**	15.0	25.5	40.5	59.5	**1000**
Higher	1.0	4.2	5.2	94.8	**96**	1.0	7.1	8.1	88.9	3.0	0.0	**99**	6.3	22.1	28.4	71.6	**95**
Literacy																	
Cannot read at all	2.0	4.0	6.0	93.9	**2060**	4.6	13.7	18.3	80.3	1.0	0.4	**2139**	23.7	25.4	49.1	50.9	**1985**
Able to read only parts of sentence	2.0	3.5	5.5	94.5	**545**	3.9	12.6	16.5	82.7	0.7	0.0	**562**	23.0	29.4	52.4	47.6	**521**
Able to read whole sentence	1.6	3.0	4.6	95.4	**1978**	2.3	9.8	12.1	86.5	1.0	0.4	**2031**	17.3	26.3	43.6	56.4	**1931**
No card with required language	1.1	4.3	5.4	94.6	**92**	5.2	10.3	15.5	83.5	1.0	0.0	**97**	17.2	23.0	40.2	59.8	**87**
Blind/visually impaired	0.0	0.0	0.0	100.0	**9**	30.0	30.0	60.0	40.0	0.0	0.0	**10**	66.7	11.1	77.8	22.2	**9**
Ever participated in a literacy program outside of primary																	
No	2.0	3.5	5.5	94.5	**3347**	4.1	13.3	17.4	81.4	1.0	0.3	**3466**	23.1	26.7	49.8	50.2	**3231**
Yes	0.6	2.6	3.2	96.8	**155**	4.4	6.9	11.3	88.1	0.0	0.6	**160**	17.9	24.5	42.4	57.6	**151**

Table 17 below shows that, children whose mother never or least read newspapers or magazines, listened to radio and watched television were more likely to be wasted 5.6 percent, 6.4 percent and 5.7 percent respectively compared to those who almost read every day in a week. About 17.2 percent, 17.8 percent and 17.1 percent of the children whose mothers don't: read newspapers and magazines, listen to radio and watch television respectively were underweight compared those whose mothers do. However, children whose mothers do not read newspapers or magazines, listen to the radio and watch television at all in a week were more likely to be stunted (49.8 percent, 50.7 percent and 50.1 percent respectively).

Table 17: Prevalence of wasting, underweight and Stunting by Mothers frequency of reading newspapers or magazine, listening to radio and watching television in the past week

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	Total
Frequency of reading newspaper or magazine																	
Not at all	2	4	6	94	**3556**	4.2	13.0	17.2	81.6	1.0	0.3	**3680**	22.7	27.1	49.8	50.1	**3437**
Less than once a week	1	3	5	95	**507**	2.5	7.7	10.2	88.3	1.0	0.6	**521**	16.5	21.7	38.2	61.8	**484**
At least once a week	1	4	5	95	**449**	1.3	10.2	11.5	87.2	0.9	0.4	**462**	15.2	26.8	42.0	58.0	**441**
Almost every day	2	2	3	97	**176**	1.7	7.8	9.5	90.0	0.6	-	**180**	11.4	19.4	30.8	69.1	**175**
Frequency of listening to radio																	
Not at all	2	4	6	94	**1624**	4.1	13.7	17.8	80.9	1.0	0.4	**1674**	23.8	26.9	50.7	49.3	**1562**
Less than once a week	1	3	5	96	**552**	3.2	13.0	16.2	82.5	1.1	0.4	**570**	20.4	26.9	47.3	52.7	**539**
At least once a week	1	3	5	95	**673**	3.3	10.9	14.2	84.5	1.0	0.3	**696**	19.2	26.6	45.8	54.2	**655**
Almost every day	2	3	5	95	**1838**	3.5	10.5	14.0	84.9	0.9	0.3	**1902**	19.1	25.3	44.4	55.6	**1779**
Frequency of watching television																	
Not at all	2	4	6	94	**3545**	4.1	13.0	17.1	81.6	0.9	0.3	**3665**	22.8	27.3	50.1	50.0	**3422**
Less than once a week	2	2	4	96	**223**	3.5	9.6	13.1	85.2	1.3	0.4	**229**	21.8	28.4	50.2	49.8	**211**
At least once a week	2	3	5	96	**178**	3.3	12.7	16.0	84.0	0.0	0.0	**181**	16.9	27.3	44.2	55.8	**172**
Almost every day	1	4	5	95	**744**	1.2	7.3	8.5	89.7	1.4	0.4	**770**	12.7	20.3	33.0	67.0	**733**

Table 18 below shows that, children whose mothers never listened to Your Health Matters, Sister Evalina, Our Neighbourhood and other health programmes were likely to be wasted 6 percent compared to those whose mothers never. Just like wasting, children whose mothers never listened to Your Health Matters, Soul City and the

Insight in the last six months were two times likely to be underweight compared to about one in ten among the children whose mothers had listened to the programmes. Five in every ten children whose mothers never listened to Your Health Matters, Sister Evalina, Our Neighbourhood and other health programmes in the last six were more likely to be stunted compared to four in every ten children whose mothers listened to the programmes.

Table 18: Prevalence of wasting, underweight and Stunting by Mothers frequency of listening to your health matters, sister Evalina, Our neighbourhood and other health programmes in last six months prior the survey.

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2 SD)	(≥-2 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2 SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2 SD)	(≥-2 SD)	Total
Listened to Your Health Matters last 6 months																	
No	2.1	4.0	6.1	93.9	**3343**	4.2	13.0	17.2	81.5	1.0	0.3	**3462**	22.7	27.4	50.1	49.9	**3222**
Yes	1.1	2.4	3.5	96.5	**1343**	2.2	9.3	11.5	87.2	0.9	0.3	**1379**	16.5	23.2	39.7	60.2	**1312**
Listened to Sister Evalina last 6 months																	
No	2.2	3.9	6.1	93.9	**3463**	4.2	12.4	16.6	82.1	1.1	0.3	**3586**	22.3	26.7	49.0	50.9	**3329**
Yes	0.8	2.4	3.2	96.8	**1223**	2.1	10.7	12.8	86.2	0.7	0.3	**1255**	17.0	24.6	41.6	58.3	**1205**
Listened to Our Neighbourhood last 6 months																	
No	2.2	3.8	6.1	93.9	**3463**	4.3	12.7	17.0	81.7	1.0	0.3	**3588**	22.5	26.7	49.2	50.8	**3330**
Yes	0.7	2.6	3.3	96.6	**1223**	1.8	9.7	11.5	87.3	0.8	0.4	**1253**	16.4	24.7	41.1	58.9	**1204**
Listened to Other health programs last 6 months																	
No	1.9	3.6	5.5	94.6	**4472**	3.7	11.9	15.6	83.1	1.0	0.3	**4623**	21.1	26.4	47.5	52.6	**4326**
Yes	1.0	2.5	3.5	96.5	**200**	1.5	11.8	13.3	84.3	1.5	1.0	**204**	17.8	21.8	39.6	60.4	**197**

Table 19 below shows that, children whose mothers never saw Your Health Matters, Soul City and the Insight were likely to be wasted (6 percent) compared to those whose mothers had seen the programmes in the last six months. Just like wasting, children whose mothers never saw Your Health Matters, Soul City and the Insight in the last six months were two times likely to be underweight compared to about one in every ten children whose mothers had seen the programme in the last six months. Further, about five in every ten children whose mothers never saw Your Health Matters, Soul City and the Insight were likely to be stunted compared to those whose mothers never saw the programmes.

Table 19: Prevalence of wasting, underweight and Stunting by Mothers frequency of seen your health matters, Soul City and Insight in last six months prior the survey.

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	Total	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	Total
Seen Your Health Matters 6 months																	
No	1.9	3.7	5.6	94.4	**3939**	4.1	12.6	16.7	82.1	0.9	0.3	**4071**	22.3	27.4	49.7	50.3	**3805**
Yes	1.3	2.7	4.0	96.0	**746**	1.3	8.6	9.9	88.4	1.3	0.4	**769**	13.6	20.1	33.7	66.3	**728**
Seen Soul City last 6 months																	
No	1.9	3.6	5.5	94.5	**4382**	3.8	12.2	16.0	82.7	1.0	0.3	**4527**	21.6	26.7	48.2	51.8	**4235**
Yes	0.7	2.6	3.3	96.7	**303**	1.0	8.0	9.0	90.1	0.3	0.6	**313**	11.7	19.5	31.2	68.8	**298**
Seen Insight last 6 months																	
No	1.9	3.6	5.5	94.5	**4459**	3.8	12.2	16.0	82.8	1.0	0.3	**4606**	21.5	26.5	47.9	52.1	**4310**
Yes	0.4	2.7	3.1	96.9	**226**	0.9	7.7	8.6	90.6	0.0	0.9	**234**	10.3	21.1	31.4	68.6	**223**

4.3.9 Decision Making by Mothers/Women in Households and Under-five Nutritional Status

Having the freedom to make decisions by mothers implies having to decide how to use oneself resources which will eventually translate into good health due to having access to quality food, health services and that of the child. Thus, this chapter presents results on the association between mothers' decision making on her resources and nutritional status of the child.

Table 20 below shows malnutrition levels by household decision making. Results indicates that children whose mothers make decisions on how to spend money are less likely to be wasted compared to those whose fathers or guardian makes decisions. Further, underweight is also high (16.6 percent) in households whose fathers make decisions on spending money compared to when decisions are made by both (14.0 percent). Stunting was also high (52.2 percent) in children whose fathers or guardians make decisions on how to spend money compared to 46 percent when decisions on spending the money are made by mothers alone or both parents.

The table further shows that children are less likely to wasted (4.5 percent) if the mother has a final say on the health care compared to (5.6 percent) if the decision is

made by respondent/father or guardian while no major relationship were observed between mothers having a final say on health care and underweight and stunting of children.

In addition the table further shows malnutrition levels by household decision making. Results indicates that children whose mothers make decisions on how to spend money are less likely to be wasted compared to those whose fathers or guardian makes decisions. Further, underweight is also high (16.1 percent) in households whose fathers make decisions on spending money compared to when decisions are made by both (14.5 percent).

Stunting was also high (51.8 percent) in children whose fathers or guardians make decisions on how to spend money compared to when decisions on spending the money are made by the mother to the child both parents (43.9 percent).

Table 20: Percentage Distribution of wasting, underweight and stunting by households decision making

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(<-2 SD)	(≥-2 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(<-2 SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(<-2 SD)	(≥-2 SD)	**Total**
Who decides how to spend money																	
Respondent alone	1.6	3.1	4.7	95.3	**490**	3.7	10.3	14.0	83.8	1.6	0.6	**513**	18.1	27.8	45.9	54.1	**486**
Respondent and husband/partner	1.5	3.1	4.6	95.4	**590**	2.8	11.0	13.8	84.0	1.7	0.5	**601**	19.6	25.9	45.5	54.5	**572**
Husband/partner alone	2.2	3.8	6.0	94.0	**317**	4.6	12.0	16.6	82.4	0.6	0.3	**324**	24.8	27.4	52.2	47.9	**307**
Other	0.0	0.0	0.0	100.0	**3**	0.0	0.0	0.0	100.0	0.0	0.0	**3**	33.3	0.0	33.3	66.7	**3**
Final say on own health care																	
Respondent alone	1.7	2.8	4.5	95.5	**1216**	4.0	11.5	15.5	83.0	1.3	0.3	**1256**	20.5	26.7	47.2	52.8	**1193**
Respondent and husband/partner	1.8	3.8	5.6	94.3	**1433**	4.1	11.4	15.5	82.6	1.4	0.5	**1480**	19.4	26.0	45.4	54.6	**1381**
Husband/partner alone	1.3	3.4	4.7	95.3	**1311**	2.8	12.2	15.0	84.2	0.6	0.2	**1358**	23.1	26.4	49.5	50.5	**1268**
Someone else	0.0	0.0	0.0	100.0	**19**	4.8	14.3	19.1	76.2	0.0	4.8	**21**	33.3	16.7	50.0	50.0	**18**
Other	0.0	0.0	0.0	100.0	**10**	0.0	20.0	20.0	80.0	0.0	0.0	**10**	30.0	20.0	50.0	50.0	**10**
Final say on making household purchases for daily needs			0.0														
Respondent alone	1.5	3.2	4.7	95.3	**2343**	3.5	11.0	14.5	84.0	1.1	0.5	**2422**	20.3	25.4	45.7	54.4	**2281**
Respondent and husband/partner	2.4	3.1	5.5	94.5	**833**	4.6	12.9	17.5	80.4	1.7	0.3	**861**	21.3	28.0	49.3	50.7	**801**
Husband/partner alone	1.3	3.9	5.2	94.9	**798**	3.0	12.6	15.6	83.8	0.5	0.1	**826**	23.2	27.0	50.2	49.8	**773**
Someone else	0.0	0.0	0.0	100.0	**9**	0.0	0.0	0.0	100.0	0.0	0.0	**10**	22.2	33.3	55.5	44.4	**9**
Other	0.0	0.0	0.0	100.0	**6**	0.0	16.7	16.7	83.3	0.0	0.0	**6**	16.7	33.3	50.0	50.0	**6**
Final say on deciding what to do with money husband earns																	
Respondent alone	2.3	2.5	4.8	95.2	**435**	5.4	11.6	17.0	82.1	0.9	0.0	**441**	17.9	26.0	43.9	56.2	**420**
Respondent and husband/partner	1.7	3.0	4.7	95.3	**1762**	3.0	11.5	14.5	83.5	1.4	0.5	**1821**	20.7	25.9	46.6	53.4	**1705**
Husband/partner alone	1.4	4.0	5.4	94.6	**1610**	3.9	12.2	16.1	82.9	0.7	0.2	**1674**	21.8	26.8	48.6	51.4	**1566**
Husband/partner has no earnings	0.9	1.8	2.7	97.3	**113**	2.6	6.8	9.4	88.9	1.7	0.0	**117**	22.2	29.6	51.8	48.1	**108**
Other	0.0	0.0	0.0	100.0	**15**	0.0	18.8	18.8	75.0	0.0	6.3	**16**	50.0	12.5	62.5	37.5	**16**

4.4 Body Mass Index of Mothers and Under-five Nutritional Status

The body mass index (BMI), or the Quetelet index, is used to measure thinness and obesity. BMI is defined as weight in kilograms divided by height in metres squared (kg/m2). A cut-off point of 18.5 is used to define thinness or acute undernutrition and a BMI of 25.0 or above indicates overweight or obesity (CSO, ZDHS, 2007). In developing countries, maternal underweight is the leading risk factor for preventable diseases such as maternal and child malnutrition and deaths (WHO, 2002).

The Pearsons product-moment correlation coefficient in Annex 5 indicates that there were small positive correlations between the mothers BMI and the nutrition indices of their children i.e., [WHZ (r=0.12, n=4686, p=0.000): WAZ(r=0.16, n=4838, p=0.000): and HAZ (r=0.07, n=4533, p=0.000)], with mothers with BMI less than 18.5 kg/m^2 associated with a child being wasted, underweight and stunted and vice-versa.

Table 21 shows that wasting was high among children whose mothers were severely underweight (< 16.0 kg/m^2) and moderately underweight (16.0 – 18.4 kg/m^2) underweight 10.7 percent and 10.1 percent respectively. About two and three in every ten children whose mothers were severely and moderately underweight were also likely to be underweight compared to about one in every ten whose mothers were overweight. In addition, about six and five in every ten children whose mothers were severely and moderately underweight were also likely to be stunted compared to four in every ten whose mothers were overweight.

Table 21: Prevalence of wasting, underweight and Stunting by Mothers Body Mass Index (BMI)

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(< -2SD)	(≥-2 SD)	**Total**
Body Mass Index (BMI)																	
Severely Underweight < 16.0	3.6	7.1	10.7	89.3	**28**	14.3	7.1	21.4	78.6	0.0	0.0	**28**	48.1	11.1	59.2	40.7	**27**
Underweight 16.0 - 18.4	3.6	6.5	10.1	89.9	**337**	6.0	21.1	27.0	72.4	0.3	0.3	**351**	25.8	26.1	51.9	48.1	**318**
Normal 18.5 - 24.9	1.7	3.4	5.1	94.8	**3516**	3.6	12.1	15.7	83.1	0.9	0.2	**3631**	21.2	26.4	47.6	52.4	**3412**
Overweight 25.0 - 29.9	1.9	2.8	4.7	95.3	**643**	2.4	8.3	10.8	86.8	1.5	0.9	**660**	18.3	25.8	44.1	55.8	**616**
Obese >= 30.0	0.0	1.2	1.2	98.8	**162**	0.6	3.6	4.2	94.0	1.2	0.6	**168**	9.4	25.6	35.0	65.0	**160**

4.5 24 Hour Dietary Diversity Score and Under-five Nutritional Status

4.5.1 Foods Consumed by Mothers in the past 24 hours prior the survey

Table 22 below shows the distribution of participants by type of food group consumed in the previous 24 hours prior the survey. The most commonly consumed foods by mothers during the past 24 hours prior the survey were other solids-semisolid food (78.9 percent), any dark green leafy vegetables (73.3 percent), fish or shellfish (51.7 percent), any other liquid (45.0 percent) and foods made from beans, peas, lentils, nuts (40.5 percent). On the other hand, the least consumed foods were Cheese, yogurt, other milk products 5.3 percent, Liver, heart, and other organs 9.5 percent, Tinned, powdered or fresh milk 10.2 percent and Eggs 13.3 percent.

Table 22: Distribution of Mothers consuming foods from various types of food groups in the past 24 hours

Food Items Eaten	n	%
Tinned, powdered or fresh milk	424	10.2
Tea or coffee	1187	28.5
Any other liquid	1876	45
Bread, noodles, other made from grains	1367	32.7
Potatoes, cassava, or other tubers	1265	30.3
Eggs	553	13.3
Meat (beef, pork, lamb, chicken, etc)	823	19.7
Pumpkin, carrots, squash (yellow or orange inside)	1236	29.6
Any dark green leafy vegetables	3063	73.3
Mangoes, papayas, other vitamin A fruits	228	5.5
Any other fruits	1329	31.9
Liver, heart, other organs	398	9.5
Fish or shellfish	2159	51.7
Food made from beans, peas, lentils, nuts	1691	40.5
Cheese, yogurt , other milk products	223	5.3
Oil, fats, butter, products made of them	1542	36.9
Chocolates, sweets, candies, pastries, etc	628	15.1
Other solid-semisolid food	3285	78.9

4.5.2 Mothers 24 Hour Dietary Diversity Score and Under-five Nutritional Status

One of the commonly used index for assessing food availability and access at both individual and household level is the Dietary Diversity Score (DDS). This index measures the number of different food groups that are consumed over a given period (Savy, 2006; Swindale, 2006; WFP; 2008; NFNC; 2009). DDS may be calculated as individual dietary diversity score (IDDS) or household dietary diversity (HDD). IDDS has been used as a proxy measure of individuals food availability and access (ability to acquire sufficient quality and quantity of food to meet all household members nutritional requirements for productive lives) and overall dietary quality (Savy, 2006; NFNC, 2009)

A number of different studies have shown that a diversified diet is directly linked to increased intake of scarce nutrient and that it is positively associated with the nutritional status of children and women. The scores for the food items that were eaten by women in the past 24 hours prior the survey were categorised into three categories so as to assess the diversification and quality of the food items eaten. These groups consist of Poor (less than 4 food items), Moderate (4 – 6 food items) and Good (More than 6 food items) (ibid, 2006).

Table 23 below shows the food consumption status as measured by the mothers' average Individual Dietary Diversity Score (IDDS). In the 2007 ZDHS the Mothers DDS was (M =5.57, SD=2.58, n=4085). In addition, an independent t-test was performed to compare the Mothers IDDS for urban and rural mothers. Results in Annexes 3 and 4 indicates that, there were statistically significant differences in Individual Dietary Diversity Scores between urban Mothers (M=6.28, SD=2.12) and rural Mothers [(M=4.79, SD=2.04); t (2023) =21.28, p=0.000] with equal variance not assumed.

In order for us to construct the mothers Individual Dietary Diversity Score (IDDS), the 18 food items mentioned in Table 21 above were grouped into fourteen food groups namely: cereals (bread, noodles and others made from grain); white tubers (potatoes, cassava, or other tuber); yellow and orange vegetables/tubers (pumpkins, carrots squash etc); dark leaf vegetables (any dark green leafy vegetables); vitamin a rich fruits (mangoes, papayas, any other vitamin a fruits); others fruits (any other fruits); meat and meat products (beef, pork, lamb, chicken, liver etc); eggs (eggs); fish (fish, shellfish); legumes (foods made from beans, peas, lentils, nuts etc); milk and milk products (cheese, yogurt, tinned and powdered milk or fresh); oils and fats (oils and fats butter or products made from them); beverages (sugary, sweets, chocolates, candies etc); and other semi-solids.

The table below shows that, rural mothers were more likely to have poor IDDS (29.1 percent) compared to urban mothers (10.2 percent). Results further reveal that about half (45.1 percent) of urban mothers had good IDDS compared to their rural counter parts (19.3 percent). A statistically significant relationship was observed between IDDS of rural and urban mothers ($p<0.01$). Households with mothers aged 40 - 44 and 45 – 49 years had poor mothers IDDS (26.8 percent and 32.5 percent respectively) compared to those in younger age groups.

There was a statistically significant relationship between mothers IDDS and the household size ($p<0.01$). The table further reveals that mothers IDDS was increasing as the family size of the household increased. About three in every ten mothers whose household size was 1 – 5 members had poor mothers IDDS compared to about 2 in every ten mothers whose households had 11 or more members. In addition, three in every ten mothers in households with 11 or more members had a good IDDS compared to 2 in every ten mothers in households with 1 – 5 members.

Four in every ten mothers with no education had poor IDDS compared to 1 in every ten mothers with secondary or higher education. Four and seven out of every ten mothers with secondary or higher education had good IDDS compared to two every ten mothers with no or primary education with a statistically significant relationship between mothers IDDS and educational level attained being observed ($p<0.01$)

Results in Table 21 below indicate a statistically significant relationship between mothers IDDS and households wealth index ($p<0.01$) with about three in every ten mothers in poorest and poorer households having a poor IDDS compared to about 1 in every ten mothers in richer wealth quintile. Four and six in every ten mothers in richer and richest wealth quintile had a good IDDS compared to two in every ten mothers in middle, poorer and poorest wealth index.

Table 23: Percentage distribution of MDDS by Demographic and Socio-economic characteristics of the women

	Poor		Moderate		Good	
	n	%	n	%	n	%
Type of Place of residence						
Urban	125	10.2	550	44.7	555	45.1
Rural	859	29.1	1519	51.5	570	19.3
Age Group						
15-19	63	23.2	148	54.4	61	22.4
20-24	260	23.8	525	48.0	309	28.2
25-29	281	23.2	578	47.7	352	29.1
30-34	192	22.4	445	51.9	221	25.8
35-39	118	24.1	237	48.4	135	27.6
40-44	57	26.8	116	54.5	40	18.8
45-49	13	32.5	20	50.0	7	17.5
Household Size						
1 - 5 Members	451	26.8	818	48.5	416	24.7
6 - 10 Members	489	21.8	1127	50.2	631	28.1
≥ 11 Members	44	17.9	124	50.4	78	31.7
Educational Level						
No education	223	39.4	247	43.6	96	17.0
Primary	652	24.4	1375	51.5	642	24.1
Secondary	104	12.0	433	49.8	333	38.3
Higher	5	6.8	14	19.2	54	74.0
Wealth quintile						
Poorest	314	32.8	480	50.1	164	17.1
Poorer	307	32.3	483	50.8	161	16.9
Middle	259	26.0	515	51.7	222	22.3
Richer	87	10.7	412	50.5	317	38.8
Richest	17	3.7	179	39.2	261	57.1
Total	**984**	**23.6**	**2069**	**49.5**	**1125**	**26.9**

A statistically significant relationship between Mothers Dietary Diversity Score (MDDS) and the child being wasted (x2=10.97, df=4, p=0.027) was observed. Table 24 below shows that children whose mothers had a poor or moderate DDS were likely to be wasted 7.5 and 5.3 percent compared to those whose mothers had a good DDS 4.5 percent.

About two in every ten children whose mothers had a poor or moderate DDS were likely to be underweight compared to one in every ten children whose mothers had a good DDS with a statistically significant relationship between the two being observed (x2=38.79, df=8, p=0.000).

In addition, a statistically significant relationship between mothers DDS and stunting in children (x2=16.73, df=4, p=0.002) was observed. Just like the above two mentioned indicators stunting among children decreased as the mothers' DDS got better.

Table 24: Percentage Distribution of children's WHZ, WAZ and HAZ by mothers IDDS in the past 24 hours before the survey

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3 SD)	(≥ -3 & <-2 SD)	(<-2 SD)	(≥-2 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(<-2 SD)	(≥-2 SD)	(≥ 2 - 2.9 SD)	(≥ 3 SD)	**Total**	(<-3 SD)	(≥ -3 & <-2 SD)	(<-2 SD)	(≥-2 SD)	**Total**
Mothers DDS																	
Poor	2.9	4.6	7.5	92.5	**955**	5.9	14.2	20.1	78.9	0.7	0.2	**983**	25.1	25.6	50.7	49.3	**927**
Moderate	1.8	3.5	5.3	94.7	**1990**	3.2	12.5	15.7	82.8	1.1	0.4	**2064**	21.4	26.5	48.0	52.0	**1912**
Good	1.3	3.2	4.5	95.5	**1082**	2.6	9.0	11.6	86.9	1.3	0.2	**1122**	18.1	25.4	43.5	56.5	**1048**

4.6 Mothers receipt of Supplements and Under five Nutritional Status

Table 25 below shows that children whose mothers had received Vitamin A post partum (2 months after delivery), drugs for intestinal worms and were given or bought iron tablets/syrup during pregnancy were less likely to be wasted, underweight and stunted compared to the children whose mothers said they never received the three supplements.

Table 25: Percentage Distribution of wasting, underweight and stunting by mothers having received Vitamin A, Drugs for intestinal parasite, given or bought Iron tablets, syrup during pregnancy

	WEIGHT FOR HEIGHT(WASTING)					WEIGHT FOR AGE (UNDERWEIGHT)							HEIGHT FOR AGE (STUNTING)				
	(<-3)	(≥ -3 & <-2)	(<-2)	(≥-2)	Total	(<-3)	(≥ -3 & <-2)	(<-2)	(≥-2)	(≥ 2 - 2.9)	(≥ 3)	Total	(<-3)	(≥ -3 & <-2)	(<-2)	(≥-2)	Total
Vitamin A first 2 Months after Delivery																	
Yes	1.5	4.2	5.7	94.3	**1430**	2.6	11.1	13.7	84.5	1.4	0.3	**1474**	18.4	25.3	43.8	56.2	**1373**
No	2.2	4.1	6.3	93.7	**1528**	4.5	12.3	16.7	82.0	0.8	0.4	**1595**	21.7	25.9	47.6	52.4	**1458**
Don't know	4.5	9.1	13.6	86.4	**22**	9.1	9.1	18.2	77.3	0.0	4.5	**22**	5.9	23.5	29.4	70.6	**17**
Drugs for Intestinal Parasites																	
Yes	1.4	3.2	4.6	95.4	**1041**	2.8	10.2	12.9	85.2	1.5	0.4	**1083**	17.1	26.2	43.3	56.7	**994**
No	2.1	4.7	6.8	93.2	**1929**	4.0	12.5	16.5	82.2	0.9	0.5	**1998**	21.5	25.4	46.9	53.1	**1845**
Don't know	7.7	7.7	15.4	84.6	**13**	21.4	14.3	35.7	64.3	0.0	0.0	**14**	30.8	15.4	46.2	53.8	**13**
Given or Bought Iron tablets/syrup during pregnancy																	
Yes	1.9	4.2	6.0	94.0	**2750**	3.5	11.4	15.0	83.5	1.1	0.4	**2853**	19.9	25.2	45.0	55.0	**2629**
No	2.6	3.9	6.5	93.5	**232**	4.6	14.9	19.5	78.8	1.2	0.4	**241**	21.6	30.6	52.3	47.7	**222**
Don't know	0.0	0.0	0.0	100.0	**1**	0.0	0.0	0.0	100.0	0.0	0.0	**1**	100.0	0.0	100.0	0.0	**1**

4.7 Initiation of Breastfeeding among Children Under-Five

4.7.1 Initiation of Breastfeeding

This chapter presents information on initiation of breastfeeding. Early initiation of breastfeeding has benefits for survival and beyond. Breastfeeding promotes child survival, health, brain and motor development (Edmond et al, 2006; Horta et al, 2007; and Mullay 2008). Early initiation of breastfeeding prevents neonatal and infant deaths by reducing the risk of infectious diseases. This is because: Colostrum, contain a large number of protective factors that provide passive and active protection to a wide variety of known pathogens. It is rich in these protective factors and its ingestion within the first hour of life prevents neonatal mortality, and exclusive breastfeeding or feeding only breast-milk eliminates the ingestion of pathogenic micro-organisms through contaminated water, other fluids etc.

Table 26 below shows that overall, 51.3 percent of the children were initiated into breastfeeding immediately after birth, and 56.3 percent within 1 hour after birth. About two thirds of urban children were initiated to breastfeeding within an hour compared to more than half of rural children.

About 55% of the children whose mothers have never been to school initiate their children to breastfeeding immediately after birth compared to about 51 percent whose mothers have attained higher education.

Disaggregated by wealth quintile, there were no major difference in the initiation of breastfeeding by mothers immediately after birth, within an hour and a day.

Table 26: Initiation of breastfeeding for children aged 6-59 months of age.

	Immediately after birth	Within 1 Hour after Birth	Within 1 day	Number
Sex				
Boys	50.9	56.5	92.9	2332
Girls	51.6	56.6	93.1	2441
Residence				
Urban	51.3	60.5	95.1	1492
Rural	51.2	54.7	91.2	3277
Mothers Education				
No Education	55.2	57.6	90.6	634
Primary	50.0	55.1	93.2	3010
Secondary	52.6	59.3	94.2	1032
Higher	50.5	64.9	91.7	97
Wealth quintile				
Poorest	50.9	56.5	92.9	1061
Poorer	51.6	56.6	93.1	1056
Middle	50.9	56.5	92.9	1095
Richer	51.6	56.6	93.1	991
Richest	50.9	56.5	92.9	570
Overall	**51.3**	**56.3**	**93.1**	**4773**

4.7.2 Duration and Frequency of Breastfeeding

The estimates of median and mean durations of breastfeeding are based on current status data, that is, the proportion of children in the three years preceding the survey who by the time of the survey were not being breastfed. Table 27 below shows that the overall median duration of any breastfeeding in Zambia was 20.0 months (the mean duration is 19.7). Disaggregated by sex, there were no difference between boys and girls in terms of median duration of breastfeeding. The table also shows that rural children were breastfed for a longer duration (20 months) than urban children (19.0 months). The table further shows that children whose mothers have no education or had just been to primary were breastfed longer 20 months compared to those whose mothers had higher education 18 months. Children born to mothers whose households are in the poorest, poorer, middle and richer wealth index were breastfed longer (about 21.0, 20.3 and 20.0 months) than those whose mothers households are in the richest wealth quintile (about 18.0 months) respectively.

Table 27: Median and Mean Duration of Any Breastfeeding

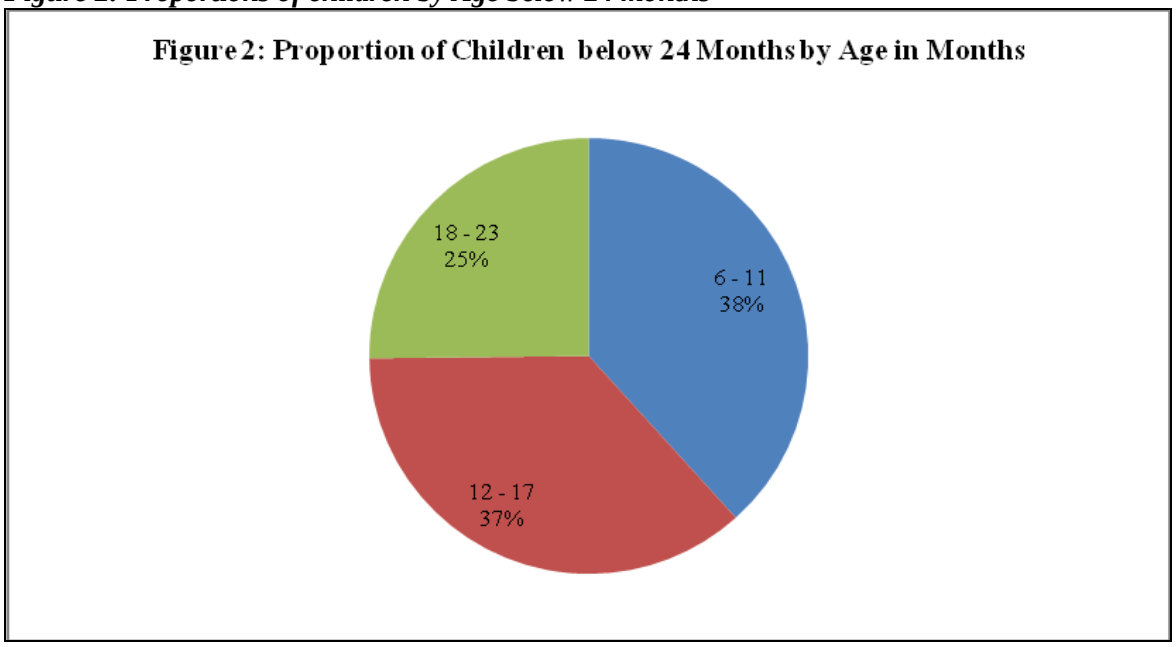
	Median	Mean	Std. Deviation	Number
Sex				
Boys	20.0	19.8	4.6	997
Girls	20.0	19.6	4.7	969
Residence				
Urban	19.0	18.7	4.7	765
Rural	20.0	20.4	4.5	1 201
Mothers Education				
No Education	20.0	19.9	5.0	212
Primary	20.0	20.2	4.4	1 188
Secondary	19.0	19.0	4.8	499
Higher	18.0	15.9	5.0	67
Wealth quintile				
Poorest	21.0	21.0	4.6	362
Poorer	20.3	20.0	4.7	368
Middle	20.0	20.1	4.2	430
Richer	20.0	19.4	4.1	478
Richest	18.0	17.7	5.3	328
Overall	**20.0**	**19.7**	**4.7**	**1 966**

4.8 Stunting among children below 24 months (6 – 23 months)

4.8.1 Percentage distribution of children 6 – 23 months

Figure 2 below shows the proportions of children aged below 24 months of age (6 – 23 months). Thirty four percent (632) of the 1 854 children were aged 6 – 11 months, 33.4 percent (619)18 – 23 months and 32.5 percent (603) were aged 12 – 17 months.

Figure 2: Proportions of children by Age below 24 months



4.8.2 Prevalence of stunting of children below 24 months by Age in months, Sex and Size at Birth

Table 28 below shows stunting levels among children less than 24 months by demographic characteristics. Overall, 44.8 percent of the children below 24 months are stunted (i.e. 21.4 percent and 23.4 percent severely and moderately stunted respectively). Stunting among these children increased with age. Children aged 18 – 23 months were more likely to be stunted 58.0 percent compared to those aged 6 – 11 months 30.8 percent ($p < 0.01$) Disaggregated by sex, about five in every ten boys were likely to be stunted compared to four in every ten girls with more boys severely and moderately stunted than girls ($p < 0.01$).

Stunting in children increased as the reported size of a child at birth decreased with 73.1 percent of children born very small likely to be stunted compared to 39.5 percent and 46.3 percent of children reported to be of larger than average and average at birth ($p< 0.01$). In addition, severe stunting also increased as the reported size of the child at birth decreased. However, children reported very large, larger than average, average were more likely to be moderately stunted compared to those reported smaller than average and very small at birth.

Table 28: Prevalence of Stunting by Age, Sex and Reported Size of the Child at Birth

	HEIGHT FOR AGE (STUNTING)				
	(< -3 SD)	(≥ -3 - -2 SD)	(<-2 SD)	(≥ -2 SD)	Total
Age (Months)					
6 - 11	13.5	17.3	30.8	69.2	548
12 - 17	19.1	26.2	45.3	54.7	545
18 - 23	31.4	26.6	58.0	42.0	567
Sex					
Boys	24.5	25.5	49.9	50.1	801
Girls	18.6	21.5	40.2	59.8	859
Size at Birth					
Very large	12.0	22.7	34.7	65.3	75
Larger than average	15.3	24.2	39.5	60.5	451
Average	22.7	23.5	46.3	53.7	935
Smaller than average	30.0	20.6	50.6	49.4	160
Very small	53.8	19.2	73.1	26.9	26
DK	23.1	38.5	61.5	38.5	13
Total	**21.4**	**23.4**	**44.8**	**55.2**	**1660**

4.8.3 Prevalence of stunting of children below 24 months by Mothers Demographic and Socio-economic characteristics

Table 29 shows that stunting in children was high 56.9 percent among children whose mothers were aged 40 – 44 years than 35.9 percent in the age group 15 – 19 years. Rural children were likely to be stunted compared to urban children. Disaggregated by province, Luapula province had the highest percentage of children stunted 55.2 percent compared to southern 34.1 percent.

Children whose mothers have only reached primary education were more likely to be stunted (47.4 percent) compared to 34.4 percent of the children whose mothers have

had higher education. Forty seven percent of the children whose mothers are poorer are stunted compared to 38.5 percent whose mothers are richer. Children whose mothers are severely underweight are less likely to be stunted 37.5 percent compared to 44.7 percent whose mothers have a normal BMI. This is surprising as mothers who are severely underweight usually tend to have children with low height for age.

Table 29: Prevalence of Stunting of children below 24 months by Mothers Age, Residence Province, and Education; and Wealth quintile

	HEIGHT FOR AGE (STUNTING)				
	(< -3 SD)	(≥ -3 - -2 SD)	(<-2 SD)	(≥ -2 SD)	Total
Age					
15-19	19.7	16.2	35.9	64.2	173
20-24	24.1	25.6	49.7	50.3	477
25-29	21.5	22.1	43.6	56.4	447
30-34	20.3	23.3	43.7	56.3	300
35-39	16.2	25.7	41.9	58.1	179
40-44	25.0	31.9	56.9	43.1	72
45-49	25.0	8.3	33.3	66.7	12
Residence					
Urban	19.3	22.4	41.7	58.3	513
Rural	22.4	23.9	46.3	53.7	1147
Province					
Central	26.2	22.0	48.2	51.8	141
Copperbelt	25.6	21.4	47.0	53.0	168
Eastern	26.4	22.1	48.6	51.4	208
Luapula	26.4	28.7	55.2	44.8	174
Lusaka	14.8	29.0	43.8	56.2	162
Northern	19.6	24.7	44.3	55.7	219
North-Western	20.7	23.9	44.6	55.4	184
Southern	17.3	16.8	34.1	65.9	220
Western	17.4	23.9	41.3	58.7	184
Mothers Education					
No education	19.2	22.9	42.1	57.9	214
Primary	23.7	23.8	47.4	52.6	1039
Secondary	17.3	22.9	40.3	59.7	375
Higher	12.5	21.9	34.4	65.6	32
Wealth quintile					
Poorest	21.3	25.4	46.7	53.3	362
Poorer	24.2	22.8	47.0	53.0	368
Middle	23.8	24.8	48.6	51.4	391
Richer	17.9	20.6	38.5	61.5	335
Richest	18.1	23.0	41.2	58.8	204
Mothers Body Mass Index					
Severely Underweight < 16.0	37.5	0.0	37.5	62.5	8
Moderate Underweight 16.0 - 18.4	25.5	22.6	48.2	51.8	137
Normal 18.5 - 24.9	21.9	22.9	44.8	55.2	1287
Overweight 25.0 - 29.9	16.7	25.8	42.5	57.5	186
Obese ≥ 30.0	12.5	35.0	47.5	52.5	40
Total	**21.4**	**23.4**	**44.9**	**55.1**	**1658**

4.8.4 Prevalence of stunting of children below 24 months by Household Size and Mothers Marital Characteristics

Children in households with 4 - 6 members were likely to be stunted, 46.5 percent compared to 40.4 percent of households with 10 members or more. About fifty percent of the children in households headed by females are likely to be stunted compared to 44.0 percent of males headed households. About three in every ten children whose mothers have are living together with a man are less likely to be stunted compared to seven in every ten children whose mother is widowed. Minimal differences were observed in stunting trends among children with regard to marital duration, number of marital unions and age at first marriage of the mothers.

Table 30: Prevalence of Stunting of children 6-24 months by demographic and socio-economic characteristics of the mothers and households

	HEIGHT FOR AGE (STUNTING)				
	(< -3 SD)	(≥ -3 - -2 SD	(<-2 SD)	(≥ -2 SD)	Total
Household Size					
1 - 3 Members	25.5	17.9	43.5	56.5	184
4 - 6 Members	22.7	23.8	46.5	53.5	847
7 - 9 Members	19.4	24.6	44.0	56.0	468
≥ 10 Members	16.1	24.2	40.4	59.6	161
Sex of Household Heads					
Male	21.1	22.9	44.0	56.0	1391
Female	23.0	26.4	49.4	50.6	269
Marital Status of Women					
Never married	12.4	17.5	29.9	70.1	137
Married	22.0	23.3	45.3	54.7	1374
Living together	18.2	9.1	27.3	72.7	11
Widowed	22.6	51.6	74.2	25.8	31
Divorced	26.5	30.9	57.4	42.6	68
Not living together	25.6	17.9	43.6	56.4	39
Marital Duration					
Never married	12.4	17.5	29.9	70.1	137
0 - 4	24.2	22.4	46.6	53.4	384
5 - 9	22.0	25.4	47.5	52.5	472
10 - 14	23.1	23.1	46.1	53.9	295
15 - 19	19.6	22.6	42.2	57.8	199
20 - 24	21.0	24.4	45.4	54.6	119
25 - 29	20.0	31.1	51.1	48.9	45
30+	11.1	33.3	44.4	55.6	9
Total	*21.4*	*23.4*	*44.9*	*55.1*	*1660*
Number of Marital Unions					
Once	22.0	24.3	46.3	53.7	1304
More than once	23.9	22.0	45.9	54.1	218
Total	*22.3*	*24.0*	*46.3*	*53.7*	*1522*
Age at First Marriage					
< 15	23.4	20.0	43.4	56.6	175
15-19	22.9	24.6	47.4	52.6	1010
20-24	20.9	22.3	43.2	56.8	292
25-29	14.6	39.0	53.7	46.3	41
30-34	0.0	25.0	25.0	75.0	4
35-39	0.0	0.0	0.0	100.0	1
Total	**22.3**	**24.0**	**46.2**	**53.8**	**1523**

4.8.5 Prevalence of stunting of children below 24 months by Mothers Employment Characteristics

There were no major differences in stunting levels among children whose mothers are either currently working or not working at all 44.4 percent and 45.5 percent respectively. Regarding occupation, children whose mothers were professionals, technicians or managers were less likely to be stunted compared to 46.1 percent of the children whose mothers are self employed in agriculture sector.

Children whose mothers work for a family member were less likely to be stunted compared to those whose mother is self employed, 31.5 percent and 47.4 percent respectively. Children whose mothers receive cash as a wage are less likely to be stunted (42.2 percent) compared to 49.5 percent whose mothers wage is both cash and in kind. About three in every ten children whose mother just earn about the same as partner are stunted compared to five in every ten whose partners does not bring money earned at home.

Table 31: Prevalence of Stunting of children below 24 months by Mothers Employment Status and type of earnings

	HEIGHT FOR AGE (STUNTING)				
	(< -3 SD)	(≥ -3 - -2 SD)	(<-2 SD)	(≥ -2 SD)	Total
Currently Working					
No	21.0	24.4	45.5	54.5	794
Yes	21.9	22.6	44.4	55.6	864
Total	**21.5**	**23.5**	**44.9**	**55.1**	**1658**
Occupation					
Professional/ Technician/Manager	18.2	9.1	27.3	72.7	22
Clerical	14.3	28.6	42.9	57.1	7
Sales	19.6	25.3	44.9	55.1	245
Agric-self employed	23.1	23.1	46.1	53.9	373
Agric-employee	25.6	18.4	44.0	56.0	125
Services	23.3	20.0	43.3	56.7	30
Skilled manual	17.9	23.2	41.1	58.9	56
Unskilled manual	0.0	33.3	33.3	66.7	3
Types of Employment					
All year	19.3	23.5	42.7	57.3	358
Seasonal	23.2	22.2	45.3	54.7	397
Occasional	25.5	19.8	45.3	54.7	106
Total	**21.8**	**22.4**	**44.3**	**55.7**	**861**
Who they work for					
For family member	16.9	14.6	31.5	68.5	89
For someone else	18.5	16.3	34.8	65.2	92
Self-employed	23.0	24.5	47.4	52.6	683
Total	**21.9**	**22.6**	**44.4**	**55.6**	**864**
Type of Earnings					
Not paid	24.2	21.2	45.4	54.6	302
Cash only	20.5	21.7	42.2	57.8	424
Cash and in kind	21.1	28.4	49.5	50.5	109
In kind only	20.7	27.6	48.3	51.7	29
Total	**21.9**	**22.6**	**44.4**	**55.6**	**864**
Earns More than Partner					
More than him	23.9	10.9	34.8	65.2	46
Less than him	20.5	26.6	47.1	52.9	297
About the same	17.4	15.9	33.3	66.7	69
Partner doesn't bring in money	47.1	5.9	52.9	47.1	17
Don't know	30.0	30.0	60.0	40.0	10
Total	**21.6**	**22.6**	**44.2**	**55.8**	**439**

4.8.6 Prevalence of stunting of children below 24 months by Mothers Literacy Levels

Four in every ten children whose mothers are able to read the whole sentence are stunted compared to five in every ten children whose mothers are able to read only parts of sentence. Children whose mothers have never participated in a literacy program outside of primary (46.8 percent) are likely to be stunted compared to 36.2 percent who have participated.

Table 32: Prevalence of Stunting of children below 24 months by Mothers Literacy Levels

	HEIGHT FOR AGE (STUNTING)				
	(< -3 SD)	(≥ -3 - -2 SD)	(<-2 SD)	(≥ -2 SD)	Total
Literacy					
Cannot read at all	23.6	22.4	46.0	54.0	776
Able to read only parts of sentence	23.2	31.5	54.8	45.2	168
Able to read whole sentence	18.6	22.4	40.9	59.1	684
No card with required language	19.2	26.9	46.2	53.8	26
Blind/visually impaired	50.0	0.0	50.0	50.0	2
Total	**21.4**	**23.4**	**44.8**	**55.2**	**1656**
Ever participated in a literacy program outside of primary					
No	23.0	23.8	46.8	53.2	1179
Yes	17.0	19.1	36.2	63.8	47
Total	**22.8**	**23.7**	**46.4**	**53.6**	**1226**

4.8.7 Prevalence of stunting of children below 24 months by Mothers Fertelity Levels

Children whose mothers have 8-11 children ever born are likely to be stunted (49 percent) compared to 43.3 percent whose mothers have 4-7 children ever born. About 49 percent of the children whose birth orders are 2-3 are stunted compared to 41 percent of the children whose birth order is 1. Forty eight percent of the children whose previous birth interval is less than 24 months were likely to be stunted compared to 44.6 percent whose birth interval is 24 – 47 months.

Table 33: Prevalence of Stunting of children below 24 months by mothers total number of children ever born, birth order and birth interval in months

	HEIGHT FOR AGE (STUNTING)				
	(< -3 SD)	(≥ -3 - -2 SD)	(<-2 SD)	(≥ -2 SD)	Total
Total Children Ever Born					
0 - 3 Children	22.3	23.1	45.5	54.5	869
4 - 7 Children	20.3	23.0	43.3	56.7	640
8 - 11 Children	21.7	27.3	49.0	51.0	143
≥ 12 Members	12.5	25.0	37.5	62.5	8
Birth Order					
1	20.1	20.7	40.8	59.2	309
2 - 3	23.7	24.9	48.6	51.4	574
4 - 6	19.4	23.9	43.3	56.7	531
7	22.4	22.4	44.7	55.3	246
Total	**21.4**	**23.4**	**44.9**	**55.1**	**1660**
Birth Interval in Months					
< 24 Months	21.6	26.6	48.2	51.8	199
24 - 47 Months	21.5	23.1	44.6	55.4	875
≥ 48 Months	22.5	25.5	48.0	52.0	275
Total	**21.7**	**24.1**	**45.8**	**54.2**	**1349**

4.8.8 Prevalence of stunting of children below 24 months by Mothers Receipt of Supplements

Table 34 below shows that children whose mothers were given or bought iron tablets, took anti-malaria drugs, de-worming tablets and Vitamin A post partum were less likely to be stunted 43.3 percent, 44.3 percent, 42.3 percent and 42.0 percent compared to those whose mothers reported that they not given or bought iron tablets, never took anti-malaria drugs, de-worming tablets and Vitamin A post partum 56.7 percent, 57.1 percent, 45.7 percent and 46.7 percent respectively.

Table 34: Prevalence of Stunting of children below 24 months by Mothers been given or buying iron tablets during pregnancy, taking any anti-malarial drugs, de-worming tablets and receiving Vitamin A 2 months postpartum

	HEIGHT FOR AGE (STUNTING)				
	(< -3 SD)	(≥ -3 - -2 SD)	(<-2 SD)	(≥ -2 SD)	Total
Given or bought Iron tablets					
Yes	20.6	22.7	43.3	56.7	1486
No	27.5	29.2	56.7	43.3	120
Took any Anti Malaria Drugs					
Yes	21.1	23.2	44.3	55.7	1599
No	28.6	28.6	57.1	42.9	7
De-worming tablets					
Yes	18.1	24.3	42.3	57.7	614
No	23.1	22.7	45.7	54.3	988
Don't Know	0.0	0.0	0.0	100.0	4
Total	**21.1**	**23.2**	**44.3**	**55.7**	**1606**
Vitamin A 2 Months Postpartum					
Yes	18.5	23.4	42.0	58.0	777
No	23.6	23.0	46.7	53.3	821
Don't Know	16.7	33.3	50.0	50.0	6
Total	**21.1**	**23.3**	**44.4**	**55.6**	**1604**

4.8.9 Stunting by 24 hour Diet Diversity Score

Table 35 below shows the stunting among children less than 24 months by mothers 24 hour DDS. The DDS ranged between 1 and 12 food items, with the mean DDS of 5.20±2.16 food items in the 24 hours prior the survey. Children whose mothers had a good DDS were less likely to be stunted 40.3 percent compared to those whose mothers had a poor DDS 50.7 percent ($P < 0.01$).

Table 35: Percentage distribution of children below 24 month diseases in the past two week by stunting levels

	HEIGHT FOR AGE (STUNTING)				
	(< -3 SD)	(≥ -3 - -2 SD)	(<-2 SD)	(≥ -2 SD)	Total
Mothers DDS					
Poor	23.7	27.1	50.7	49.3	410
Moderate	22.3	22.1	44.4	55.6	816
Good	17.6	22.7	40.3	59.7	432
Total	**21.4**	**23.5**	**44.9**	**55.1**	**1658**

4.8.10 Diseases in the last two weeks

Table 36 below shows that children who had diarrhoea in the last two weeks prior the survey were more likely to be stunted 47.4 percent compared to 44.0 percent of the children who never had diarrhoea. Twenty two percent of the children who had fever in the last two weeks were likely to be severely stunted compared to 21.3 percent who never had a fever. In addition, about twenty two percent of the children who had a cough in the last two weeks were likely to be severely stunted compared to 21.3 percent who never had a cough in the last two weeks.

Table 36: Percentage distribution of children below 24 months diseases in the past two week by stunting levels

	HEIGHT FOR AGE (STUNTING)				
	(< -3 SD)	(≥ -3 - -2 SD)	(<-2 SD)	(≥ -2 SD)	Total
Had diarrhoea in last two weeks					
No	21.1	22.9	44.0	56.0	1212
Yes	22.4	25.1	47.4	52.6	447
Had fever in last two weeks					
No	21.3	24.3	45.5	54.5	1256
Yes	22.1	20.8	42.9	57.1	403
Had cough in last two weeks					
No	21.3	24.1	45.4	54.6	1157
Yes	21.9	21.9	43.8	56.2	502
Total	**21.5**	**23.4**	**44.9**	**55.1**	**1659**

CHAPTER FIVE

Determinants of child malnutrition in Zambia based on the adapted UNICEF conceptual framework

5.1 Suitability of the binary logistic regression model in determining the influence of maternal characteristics on under-5 Nutritional Status

Binary logistic regression was used to analyze relationships between the dependent categorical variable (weight-for-height, weight-for-age, and height-for-age) and explanatory variables (mothers education, BMI, DDS, wealth index, birth order, previous birth interval, number of antenatal visits). This was because; the data had explanatory variables that were either categorical or continuous, or a mix of both in one model. The model allowed us to test models to predict categorical outcomes with two or more categories (Pallant, 2005). It also combined the independent variables to estimate the probability that a particular event will occur, i.e. a subject will be a member of one of the groups defined by the dichotomous dependent variable.

This model has been used in a number of situations such as: calculation of risk of heart disease as a function of certain personal and behavioural characteristics such as age, weight, blood pressure, cholesterol level, and smoking history; and calculation of the risk teenage pregnancy as a function of academic performance, religion, and family size

The variate or value that was produced by binary logistic regression was a probability value between 0.0 and 1.0. If the probability for group membership in the modelled category was above some cut-off point (the default is 0.50), the subject was predicted to be a member of the modelled group. If the probability was below the cut-off point, the subject was predicted to be a member of the other group. For any given case, the model computed the probability that a case with a particular set of values for the independent variable was a member of the modelled category. However, since we were

interested in estimating the probability that an event will occur as against the probability that it will not occur when we used the model, the dependent variable in logistic regression was the odds ratio, which is just another way of expressing probability.

5.2 Maternal Determinants of Child Malnutrition in Zambia

Tables (37 and 38) below shows the binary logistic regression adjusted odds ratios and their corresponding p-values for each of the maternal explanatory variables. Employing a p=.05 criterion of statistical significance, mothers iron supplementation, anti-malaria drugs, de-worming, Household Dietary Diversity Score (HDDS) as immediate determinants; quantity of food items consumed by mother, mothers number of ante-natal visits, source of drinking water and type of toilet facility as underlying determinants; mothers previous birth interval, education and wealth index as basic determinants; and sex of the child and mothers Body Mass Index (BMI) as temporal determinants of child malnutrition.

Among the immediate maternal determinants of child stunting (Table 37), the binary logistic regression shows that, children whose mothers had not taken iron tablets whilst pregnant were 0.7 times likely to be stunted compared to those who had taken the tablets. A significant association was also observed between mothers 24 hour HDDS and child stunting, with children whose mothers had a poor (1 – 3 foods) and moderate (4 – 6 foods) 24 hour dietary diversity scores being more likely to be stunted 0.7 and 0.9 than those whose mothers had good (7 or more foods) 24 hour dietary diversity score. With regard to underweight, a mother not taking any anti-malaria drugs whilst pregnant and de-worming tablets was associated with the child being underweight 0.3 and 0.1than those whose mothers took. The odds of the child being underweight was 0.6 and 0.7 times higher among children whose mothers had poor (1 – 3 foods) and

moderate (4 – 6 foods) dietary diversity score than those who had good 24 hour dietary diversity score (7 or more foods). For wasting, children whose mothers had not taken de-worming tablets are 0.6 times more likely to be wasted compared to those children whose mothers took the tablet. This survey also showed that children whose mothers had poor (1 – 3 foods) and moderate (4 – 6 foods) 24 hour dietary diversity score were 0.7 and 1.0 times more likely to be wasted than those who had good dietary diversity score (7 or more foods).

The binary logistic regression further reveals that among the underlying maternal determinants of child malnutrition (Table 37), children whose mothers consumed less than 4 food items within 24 hours prior the survey were 1.2 times more likely to be stunted than those whose mothers consumed 4 or more foods. As compared to children whose mothers attended ante-natal clinics for 5 or more times, the risk of stunting in children whose mothers never attended ante-natal clinics was about 0.6 higher. Furthermore, children whose mothers consumed less than 4 food items were 0.7 times more likely to be underweight than those whose mothers consumed 4 or more foods. It was also observed that children whose mothers never went for ante-natal clinics were 0.6 times more likely to be underweight than those whose mothers went for 5 or more times. Besides the above mentioned, the odds of a child being wasted was 0.6 times higher in children whose mothers consumed less than 4 food items within 24 hours prior the survey than those whose mothers consumed 4 or more foods. Children whose mothers went for ante-natal clinics for 1 – 4 times were 1.4 times likely to be wasted than children whose mothers went for 5 or more times.

Among the maternal basic determinants of under five malnutrition in Zambia (Table 38), the model showed that children whose mothers previous birth intervals were 1and 2 years were 7.2 and 0.6 times more likely to be stunted compared with children whose

mothers previous birth interval was 4 or more years. Wealth Index is also another important variable explaining child stunting. As compared to children in mothers households with richest wealth index, children in poorest, poorer, middle and richer wealth indexes were 0.4, 0.4, 0.3 and 0.4 more likely to be stunted. The odds of a child being underweight among mothers whose households wealth index are poorest, poorer, middle and richer were 0.1, 0.4, 0.1 and 0.3 times than those whose mothers households are richest. The likelihood of a child being wasted was found to be 10.6 times higher among mothers who had no education than children whose mothers had higher education. The odds of child being wasted was 0.1 times more among mothers households whose wealth index was poorest than those whose mothers households wealth index was richest.

Lastly, the model (Table 38) shows that, the odds of boys being stunted, underweight and wasted were 0.8, 0.7 and 0.7 times more than girls. The likelihood of a child being stunted was 0.4, 0.5, 0.6 and 0.7 times higher among children whose mothers BMI were severely underweight, moderately underweight, normal and overweight compared to those whose mothers BMI was Obese. Further, the odds child being underweight was 0.2, 0.1, 0.2 and 0.4 times higher among children whose mothers BMI were severely underweight, moderately underweight, normal and overweight compared to those whose mothers BMI was Obese. Children whose mothers BMI were severely underweight, moderately underweight, normal and overweight, were 0.1, 0.1, 0.2 and 0.3 times likely to be wasted than children whose mothers BMI was obese.

Table 37: Maternal immediate and underlying determinants of stunting, wasting and underweight among under five children (6 – 59) months of age in Zambia.

Explanatory Variables	Stunting		Underweight		Wasting	
	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)
Immediate Determinants						
Vitamin A Postpartum						
Yes[RC]		1		1		1
No	0.252	0.905	0.133	0.839	0.955	1.01
Iron						
Yes[RC]		1		1		1
No	0.029**	0.704	0.101	0.731	0.882	0.957
Anti-malaria drug (any)						
Yes[RC]		1		1		1
No	0.889	1.113	0.087***	0.281	0.999	89739657
De-worming						
Yes[RC]		1		1		1
No	0.214	0.893	0.089***	0.809	0.013**	0.623
HDDS						
Poor	0.015**	0.746	0.000*	0.56	0.077***	0.671
Moderate	0.269	0.895	0.040**	0.744	0.969	1.008
Good[RC]		1		1		1
Underlying Determinants						
Quantity of Food Items Consumed						
< 4 Food Items	0.038**	1.236	0.002**	0.68	0.011**	0.629
>= 4 Food Items		1		1		1
Initiation of Breastfeeding						
Within 1 hour		1		1		1
Within a day	0.734	0.97	0.663	0.95	0.862	1.031
After 1 day of birth	0.212	0.807	0.837	0.955	0.329	0.75
Number of Ante-natal Visits						
No Visit	0.093***	0.643	0.057***	0.588	0.39	0.719
1 - 4 Times	0.783	0.975	0.51	1.083	0.064***	1.379
5 or more times		1		1		1
Source of Drinking Water						
Protected/Safe Water		1		1		1
Unprotected/Unsafe Water	0.506	0.941	0.938	0.991	0.041**	1.438
Availability of Toilet Facility						
Any Facility (Flush, VIP Latrine etc)		1		1		1
No Facility (Bush, Field etc)	0.216	0.885	0.428	0.904	0.076***	0.719

RC= Reference Category
****Refers to significant at 0.001, **Refers to significant at 0.05 and ***Refers to significant at 0.1***

Table 38: Maternal Basic and Temporal determinants of Stunting, Wasting and Underweight among under five children (6 – 59) months of age in Zambia.

Explanatory Variables	Stunting		Underweight		Wasting	
	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)
Basic Determinants						
Birth Oder						
2 - 3	0.519	0.858	0.488	0.813	0.535	1.348
4 - 6	0.976	1.007	0.478	1.225	0.327	1.577
7		1		1		1
Previous Birth Interval						
1 Year	0.064***	7.277	0.773	0.79	0.999	94018065
2 Years	0.058***	0.628	0.778	1.089	0.864	0.915
3 Years	0.541	1.148	0.358	1.321	0.195	0.581
4 or more Years		1		1		1
Educational Level						
No education	0.274	2.017	0.309	2.802	0.035**	10.624
Primary	0.51	1.489	0.41	2.235	0.009**	15.173
Secondary	0.134	2.458	0.281	2.825	0.041**	7.552
Higher		1		1		1
Wealth Index						
Poorest	0.052**	0.433	0.005**	0.133	0.037**	0.114
Poorer	0.035**	0.398	0.055***	0.244	0.126	0.193
Middle	0.002**	0.294	0.001*	0.1	0.236	0.317
Richer	0.007**	0.39	0.043**	0.271	0.244	0.382
Richest		1		1		1
Type of Residence						
Urban		1		1		1
Rural	0.192	0.709	0.614	1.185	0.178	2.364
Household Size						
1 - 5 Members		1		1		1
6 - 10 Members	0.489	1.132	0.643	1.11	0.383	1.384
11 or more Members	0.479	1.284	0.893	1.066	0.808	0.842
Mothers Employment						
All Year		1		1		1
Seasonal/Occasional	0.323	1.194	0.542	1.147	0.506	0.763
Temporal Determinants						
Sex of the Child						
Boys	0.000*	0.767	0.000*	0.733	0.022**	0.74
Girls		1		1		1
Mothers Body Mass Index						
Severely Underweight	0.035**	0.415	0.004**	0.176	0.021**	0.114
Moderately Underweight	0.000*	0.48	0.000*	0.117	0.003**	0.115
Normal	0.001*	0.573	0.000*	0.232	0.038**	0.226
Overweight	0.030**	0.668	0.012**	0.362	0.064***	0.255
Obese		1		1		1

RC= Reference Category

****Refers to significant at 0.001, **Refers to significant at 0.05 and ***Refers to significant at 0.1***

To identify the other determinants of child malnutrition apart from the maternal factors, multivariate (Binary Logistics regression) was performed for each of the explanatory variables with regard to child malnutrition (stunted, underweight and wasting). In addition, the logistic regression models were performed separately urban and rural and overall (Urban and rural). The model reveals that child's age in months, size at birth, having diarrhoea and fever two weeks prior the survey were some of the other determinants of child malnutrition besides the maternal characteristics (Table 39).

With regard to stunting, the results indicates that overall, age in months of the child, Childs size at birth and having diarrhoea within two weeks prior the survey are the other determinants of child stunting in Zambia. This model showed that children aged 12 – 23; 24 – 35; 36 – 47; and 48 – 59 months were 0.4, 0.4, 0.5 and 0.6 times more likely to be stunted than children aged 6 – 11 months. The results further showed that as compared to children born very large, children born average, smaller than average and very small are 0.8, 0.7 and 0.4 times likely to be stunted. The likelihood of a child being stunted was found to be 1.2 times higher among children who had diarrhoea within two weeks prior the survey than those who did not. Segregated by residence, for urban children, the model reveals that age in months and childs size at birth where other important determinants of child stunting. Children aged 12 – 23; 24 – 35; and 36 – 47 were 0.4, 05 and 0.5 times likely to be stunted than those aged 6 – 11 months. The odds of stunting among children born smaller than average and very small were 0.5 and 0.3 times more than those born very large. For rural children, the analyses showed that child's age in months and size at birth and having diarrhoea two weeks prior the survey are the other determinants of child stunting in Zambia. The odds of children aged 12 – 23; 24 – 35; 36 – 47; and 48 – 59 months to be stunted were 0.5, 0.4, 0.4 and

0.5 times than children aged 6 – 11 months. Children born very small were 0.4 times likely to be stunted than those born very large. The odds of stunting among children was 1.3 times among those who had diarrhoea within two weeks prior the survey compared to those who had no diarrhoea.

Table (39) further shows that, overall, age in months of the child, Childs size at birth and having diarrhoea and Fever within two weeks prior the survey are the other determinants of child underweight in Zambia. This model showed that children aged 12 – 23; 24 – 35; and 48 – 59 months were 0.7times more likely to be underweight than children aged 6 – 11 months. The results further showed that as compared to children born very large, children born smaller than average and very small are 0.5and 0.2 times likely to be underweight. The likelihood of a child being underweight was found to be 1.3 and 1.4 times higher among children who had diarrhoea and fever within two weeks prior the survey than those who did not. Segregated by residence, for urban children, the analysis showed that age in months and child's size at birth where other important determinants of child underweight. Children aged 12 – 23 and 24 – 35 were 0.6 times likely to be underweight compared to those aged 6 – 11 months. The odds of underweight among children born larger than average, average, smaller than average and very small were 0.2, 02, 0.1 and 0.1 times more compared to those born very large. For Rural children, the analyses showed that child's size at birth and having diarrhoea two weeks prior the survey are the other determinants of child underweight in Zambia. This model revealed that children aged 12 – 23; 24 – 35; and 48 – 59 months were 0.7, 0.7 and 0.6 times more likely to be underweight than children aged 6 – 11 months. Children born smaller than average and very small were 0.6 and 0.3 times likely to be underweight than those born very large. The likelihood of a child being

underweight was found to be 1.5 times higher among children who had diarrhoea and fever within two weeks prior the survey than those who did not.

The results indicates that overall, age in months of the child, Childs size at birth and having diarrhoea two weeks prior the survey are the other determinants of child wasting in Zambia. This model showed that children aged 24 – 35; 36 – 47; and 48 – 59 months were 1.8, 3.2 and 2.2 times more likely to be wasted than children aged 6 – 11 months. The results further showed that as compared to children born very large, children born smaller than average and very small were 0.5 and 0.4 times likely to be wasted. The likelihood of a child being wasted was found to be 1.4 times higher among children who had diarrhoea within than those who did not. Segregated by residence, for urban children, the analysis showed that age in months and childs size at birth where other important determinants of child wasting. Children aged 48 – 59 months were 2.4 times likely to be wasted than those aged 6 – 11 months. The odds of wasting among children who had diarrhoea within two weeks prior the survey was two times higher than those who did not have. Regarding rural children, the analyses showed that child's age in months and size at birth and having diarrhoea two weeks prior the survey were the other determinants of child wasting in Zambia. This model revealed that children aged 12 – 23; 24 – 35; 36 – 47; and 48 – 59 months were 1.7, 2.0, 5.1 and 2.3 times more likely to be wasted than children aged 6 – 11 months. Children born smaller than average were 0.3 times likely to be wasted than those born very large.

Table 39: Other determinants of child stunting, underweight and wasting by residence

	Stunting						Underweight						Wasting					
	Overall		Urban		Rural		Overall		Urban		Rural		Overall		Urban		Rural	
Explanatory Variables	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)	Sig.	Adjusted Exp(B)
Age in Months																		
6 – 11[RC]		1		1		1		1		1		1		1		1		1
12 - 23	0.000*	0.421	0.000*	0.361	0.000*	0.456	0.011**	0.691	0.083***	0.61	0.067***	0.733	0.1	1.357	0.368	0.714	0.013**	1.721
24 - 35	0.000*	0.413	0.000*	0.462	0.000*	0.39	0.005**	0.659	0.084***	0.605	0.029**	0.684	0.005**	1.773	0.563	1.27	0.003**	2.002
36 - 47	0.000*	0.458	0.003**	0.539	0.000*	0.429	0.1	0.774	0.326	0.741	0.21	0.796	0.000*	3.16	0.693	1.186	0.000*	5.119
48 - 59	0.000*	0.548	0.117	0.714	0.000*	0.493	0.007**	0.659	0.494	0.807	0.008**	0.621	0.000*	2.238	0.095***	2.414	0.001*	2.255
Child Size at Birth																		
Very Large[RC]		1		1		1		1		1		1		1		1		1
Larger than Average	0.753	0.954	0.774	0.921	0.701	0.934	0.65	0.906	0.044**	0.228	0.509	1.169	0.252	0.645	0.58	0.706	0.379	0.653
Average	0.094***	0.786	0.192	0.695	0.236	0.817	0.122	0.723	0.026**	0.199	0.682	0.912	0.211	0.627	0.845	0.885	0.217	0.561
Smaller than Average	0.036**	0.7	0.044**	0.52	0.255	0.795	0.002**	0.478	0.008**	0.135	0.044**	0.599	0.055***	0.458	0.654	1.422	0.029**	0.335
Very Small	0.004**	0.423	0.044**	0.353	0.023**	0.431	0.000*	0.218	0.001*	0.055	0.001*	0.275	0.079***	0.372	0.227	0.349	0.286	0.446
Diarrheoa																		
No[RC]		1						1		1		1		1		1		1
Yes	0.084***	1.16	0.797	1.039	0.027**	1.264	0.005**	1.349	0.464	1.157	0.002**	1.477	0.024**	1.44	0.014**	1.957	0.356	1.208
Fever																		
No[RC]		1						1		1		1		1		1		1
Yes	0.745	1.029	0.588	0.918	0.701	1.042	0.001*	1.448	0.192	1.316	0.004**	1.454	0.335	1.19	0.472	1.252	0.525	1.152
Cough																		
No[RC]		1						1		1		1		1		1		1
Yes	0.759	0.977	0.851	0.975	0.97	1.004	0.138	0.858	0.404	0.853	0.313	0.882	0.114	0.765	0.296	0.738	0.304	0.804

RC= Reference Category

****Refers to significant at 0.001, **Refers to significant at 0.05 and ***Refers to significant at 0.1***

CHAPTER SIX

Discussion, Conclusion and Policy Implication

6.1 Discussion

The main purpose of this study was to examine the influence of maternal characteristics on under-5 (6-59 months of age) malnutrition in Zambia. Researchers suggest that maternal characteristics tend to determine the nutrition status of children below the age of five. Thus, this thesis explored the nutritional status of under five children (Wasting, Underweight and Stunting) based on the United Nations Children's Fund (UNICEF) modified conceptual framework of the determinants of the nutritional status to determine the influence that maternal characteristics have on under five nutritional status. This was done because it is believed that the impact of malnutrition is multifarious and that it has an all insidious impact on the physical well-being and socio-economic condition of a nation.

According to the findings of this study, the prevalence of malnutrition (wasting, underweight and stunting) among children under-five in Zambia are very high currently standing at 5.3 percent, 15.6 percent and 47.1 percent respectively. Progress towards the reduction of wasting, underweight and stunting has been limited in Zambia with 6 percent, 21 percent and 46 percent around 1990, compared with 5 percent, 15 percent and 45 percent around 2007 (CSO, MOH, TDRC, UNZA and Macro Inc., 2009). This shows that Zambia has a very high prevalence of wasting, underweight and stunting according to the classification established by the World Health Organization to indicate levels of child malnutrition (Lindsay and Gillespie, 2001). In addition, the study findings further reveal that girls fared better than boys in terms wasting, underweight and stunting respectively. These findings are backed up by a study conducted by

Girmay et al in Ethiopia 2010 were girls were better nutritionally than boys, implying vulnerability of the latter to the existing harsh environment. On the contrary, these results contradict with what Mbago et al found in a study conducted in Tanzania in 1991 among children less than four years of age and Sapkota et al in 2009 in Nepal in which they concluded that males had better nutritional status than females.

Similarly, wasting in children under five decreased as the age of the child increased, with children aged 6 – 11 months being more wasted than those aged 36 – 47 months. In contrast, underweight and stunting in children increased by 12 months of age (Table 7). These findings are in agreement with what others Anderson in 1995 and Aschalew in 2000 found, in that a cumulative indicator of growth retardation stunting (height-for-age) in children is positively associated with age. Hence the current situation being observed that stunting increases with age of the child (Yimer, 2000; Genebo et al., 1999; Samson and Lakech, 2000. Studies have further shown that, children's nutritional status is also more sensitive to factors such as feeding/weaning practices, care, and exposure to infection at specific ages. Further, underweight also increases with age due to deficiency (low nutritional quality) of supplementary foods after six months of age that influence nutritional status since mother's milk alone is not adequate beyond 6 months (Sumonkati et al, 2008; Mishra and Rutherford, 2000). Thus, this is very much in agreement with our conceptual frame which shows that if the diet of the child is in adequate the chances of being vulnerable to malnutrition and other opportunistic infections are very high making them even more vulnerable.

Therefore, by looking at the forgoing paragraph, future research should take recognisance of the fact that, children aged from birth to 59 months do not form homogenous group as prevalence are affected by distribution of ages included in the survey. This implies that separate estimates of prevalence of underweight and stunting

should be made for younger birth to 24 months and older children for purposes of describing trends and vulnerability.

According to studies by Ajao et al in Nigeria and Girmay et al in 2010, it was found that children with birth weight less than 2.5 kilograms were more likely to be underweight. These findings are in tandem with our study with all the three nutritional indices (wasting, underweight and stunting) indicating that, children who were born either very small or smaller than average were more likely to be wasted, underweight and stunted compared to those born with average, very large and larger than average weight. This just like the underlying cause of malnutrition in our conceptual framework shows that the women's quality of health and nutrition care (e.g. in adequate weight, socio-economic factors such as low income non availability of resources and lack of education etc.) that women receive whilst they are pregnant is very essential to the birth outcomes. This is because babies born with low birth weight (less than 2.5 kilograms) are at increased risk for serious health problems as newborns, lasting disabilities and even death.

Besides the above, children whose mothers are from rural areas were likely to be wasted, underweight and stunted compared to those in urban areas. This finding can be explained by the urban-rural differentials with the 2007 ZDHS revealing that there were systematic inequalities in various measures between urban and rural settings These findings are also comparable to a studies on maternal and nutritional status in 16 of the 18 DHS conducted countries (Loaiza, 1997) and a study in the SNNPR of Ethiopia (Teller and Yimar, 2000) which showed that rural women and children are more likely to suffer from chronic energy deficiency than women and children in urban areas. Thus, as indicated above, our study confirms the fact that, these nutritional indices are manifested differently in rural and urban areas due to different demographic and

socioeconomic characteristics that exist in these areas among women of child bearing age ($p < 0.01$). Therefore, we reject the null hypothesis and accept the alternative which states that children whose mothers have better maternal demographic and socio-economic factors are less likely to be malnourished than those whose mothers have poor demographic and socio-economic characteristics.

Wasting and underweight were high among children whose mothers were very young 15 – 19 years compared to those in the age group 20 – 24 years. This is similar to what other studies have found that women's age is an important factor in that it affects child nutrition status, especially in high fertility countries (Zerihun, 1997, as cited in Winkvisit, 1992). Also according to DHS surveys conducted in Burkina Faso, Ghana, Malawi, Namibia, Niger, Senegal, and Zambia, it was observed that a greater proportion of mothers age 15-19 and 40-49 exhibited chronic energy deficiencies (CED) than those in the other age groups. Furthermore, a statistically significant difference in mother's births in the past three years and a child being wasted ($p< 0.01$) was observed. Children whose mothers had given birth to three children in the past three years were more likely to be wasted, underweight and stunted. Similar findings have shown that closely spaced pregnancies are often associated with the mother having little time to regain lost fat and nutrient stores (ACC/SCN, 1990).

Mothers with poor child spacing usually have little time to recover before conceiving again. Poor child spacing is also likely not to improve child nutrition, since the mother has little time for proper childcare and feeding as she spends more time with the younger sibling even though the weaned older sibling may not be quite old enough to help him or herself. That child is likely to be ignored much more than is desirable and may not get sufficient maternal stimulation to optimize his/her neurological development (Ajao et al, 2010; Girmay, 2010). This according to our adapted UNICEF

conceptual framework exacerbates the problem of malnutrition in children due to poor dietary intake which is one of the immediate determinants of malnutrition in children.

Mother's nutritional status is another important demographic factor influencing child nutritional status in Zambia. These findings are in agreement a study conducted by Rayhan and Sekander in Bangladesh in 2006, where a significant relationship ($p<0.01$) was found between mothers BMI and the children undernutrition, with children of well nourished mothers having a lower risk of being underweight compared to children of acutely malnourished mothers. This may be attributed to thin or malnourished mothers not been able provide sufficient breast milk to the child because of their nutritional deficiency.

In addition, some evidence in developing countries indicate that malnourished women with a Body Mass Index (BMI) below 18.5, show a progressive increase in mortality rates as well as increased risk of illness (Rotimi, 1999). For social and biological reasons, women of the reproductive age are amongst the most vulnerable to malnutrition. Birth weight, child growth, and adolescent growth determine nutritional status before and during pregnancy (ACC/SCN, 1992). The presence of an intergenerational link between maternal and child nutrition means a small mother will have small babies who in turn grow to become small mothers. Other studies also found that there is a relationship between maternal and child nutrition (Loaiza, 1997; Teller et al., 2000; Genebo et al., 1999) with a high proportion of low-birth-weight (underweight) and stunted children been observed among underweight mothers.

Furthermore, female headed households had more children wasted, underweight and stunted than male headed households. Research elsewhere has also shown that marital status of the woman is associated with household headship and other social & economic status that affects both her nutritional status and that of the child (Teller and

Yimar, 2000). This is also in agreement with the adapted UNICEF conceptual framework used in this study where by the availability of resources to the female headed households are usually scarce making them more vulnerable to achieving food and nutrition security at household level.

Similarly, children in households with ten or more people were likely to be wasted and underweight than those with fewer household members. These results confirm the findings that were found by Ajao et al in 2010 in Nigeria were it was reported that the total number of members in the family is also related to the incidence of adverse circumstances. Studies have also shown that the food available to larger families per head is frequently lower than that available to smaller families and this difference is reflected in the growth rate. That is per capita food intake decreases with an increase in family size (Vis et al, 1975). In addition, Sumonkanti et al in 2008 in an exploratory study of the predictors of child chronic malnutrition using the 2004 Bangladesh DHS found that households with huge family size experienced higher risk to having malnourished children in comparison to smaller households. The children of households with 7 or more members had about 50 percent more risk to be malnourished than those of households with 4 or fewer members.

The present study (table 11) reveals that malnutrition was high among children whose mother were widowed, Divorced or never married than those married or living together. Studies suggest that, nutritional and social security's of the child could be endangered by a negative change in their mother's marital status. For example, according to a study conducted by Teller and Yimar in 2000 in the SNNPR Region of Ethiopia showed that children's nutrition status is significantly associated with mother's marital status indicating that compared to married women, poor nutritional status is higher among children whose mothers are unmarried and divorced/separated.

Another major finding from this study was that, children whose mothers have been married only once were twice as likely to be wasted compared to those who have been married more than once. This finding is contrary to what other studies conducted elsewhere have found. In contrast, children whose mothers have being married more than once were more likely to be underweight and stunted compared to those whose mothers have only being married once. This finding may be attributed to the fact that, children whose mothers are not in stable homes may experience short or long term socio-economic problems which may results in their children having a low weight-for-age and height-for-age Z-scores. None the less, this may call for further research as to the best of our knowledge there is little scientific information on how the number of marital unions a woman has gone through affect child nutritional status.

The level of mothers' education is an asset to the child's proper growth and its better nutritional status. Results indicates that children whose mothers had no education were likely to be wasted underweight and stunted compared to those whose mothers had higher education. Maternal education has consistently shown to be critical for child health, nutrition and survival. Evidence from various studies indicates that knowledge and practices are key pathways. Educated women are likely to be more aware of nutrition, hygiene and health care (Ajao et al 2010). In addition, educated mothers are more conscious about their children's health. They can easily introduce new feeding practices which can improve the nutritional status of children (Sumonkanti et al, 2008). Similarly, it is also one of the most important resources that enable women to provide appropriate care for their children, which is an important determinant of children's growth and development (Engle and Menon, 1996).

It is a well known fact that poor health and dietary intake (immediate determinants) have a synergistic effect on child malnutrition. Children who suffer from malnutrition

are generally at an increased risk of illness and death. However, risk factors for malnutrition and illness include but are not limited to these two immediate determinants of malnutrition but also environment factors which are underlying causes. Studies show that unfavourable health environment caused by inadequate water and sanitation can increase the probability of infectious diseases and indirectly cause certain types of malnutrition (UNICEF, 1990; Engle, 1992). However, results in this study reveal that, there was a statistically insignificant relationship between the mothers household water source and the child being wasted ($p>0.05$) and underweight ($p> 0.05$). Children whose mother's household water sources were piped into dwelling, piped to yard/plot, protected well and others sources were likely to be wasted compared to children whose mothers households water source were River/dam/lake/ponds/stream/canal/irrigation channel. This results is contrary to what is tabulated in the conceptual frame were healthy environment is considered to be a proxy indicator to reducing water bone diseases such as diarrhoea which makes children more vulnerable to malnutrition as their immune system is weakened by loss of the much needed minerals and nutrients. However, this result may be attributed to the way the variable was measured as all those with water sources considered not to be safe and clean were converted into one variable.

In contrast, there was a statistically significant relationship between child stunting and water source for the household ($p<0.01$). This finding is backed up by findings from studies in other developing countries (Sommerfelt et al., 1994) and in Jimma, Ethiopia (Getaneh et al., 1998) which found that unprotected water source were associated with low height-for-age for the child. This study has also shown that, children whose households had no toilet i.e., facility/bush/field were likely to be wasted, underweight

and stunted. Some evidence also indicates that and non-availability of latrine is associated with child stuntedness (Sommerfelt et al., 1994; Getaneh et al., 1998).

Another major finding of the study is that, children whose mothers' do not smoke cigarettes were likely to be wasted and stunted compared to those whose mothers smokes though not statistically significant. This finding is contrary to about 150 studies that have been published linking tobacco smoking not only to a child being born undernourished but also increasing respiratory illness in children, with meta-analysis finding strong evidence for associations between maternal smoking and risk of Acute Respiratory Infection (ARI) (DiFranza et al, 2004). The reason behind our finding may be attributed to the fact that, in absolute terms, there were very few records of women who smoked compared to those who do not smoke.

Besides the above, children whose mother smokes were likely to be underweight compared to those whose mothers do not smoke. This finding is in line with what other studies, where, maternal smoking during pregnancy increases differences in birth weights between smokers and non smokers, increases the risk of ARI, with term infants dying from ARI being 3.4 times more likely to have had mothers who smoked during pregnancy (Malloy et al 1998; DiFranza et al, 2004).

Women's employment increases household income, with consequent benefit to household nutrition in general and the woman's nutritional status in particular. Employment may also increase women's status and power, and may bolster a woman's preference to spend her earnings on health and nutrition. Though employed, women without control over their income and decision making authority within the household are deprived of economic and social power and the ability to take actions that will benefit their own well-being. Studies in Africa have indicated that, at similar levels of income, children in which women have a greater control over their income are more

likely to be food secure and nutritionally sound (ACC/SCN, 1990; Kennedy and Haddad, 1991; Girma, 2002). These findings are in agreement with what our study found were children whose mothers were seasonally or occasionally employed and earned cash and in kind or in kind only were likely to be malnourished compared to those whose mothers were employed all year and paid cash only. Therefore, results indicate that a woman's decision making autonomy over her own cash earnings is another important variable found to be protective against any form of malnutrition to the children. In this study, the expenditure of women's cash decided by others (partially or fully) is related to poor nutritional status of the child. Consistent with a study by von Braun (1991), this study has shown that when cash is controlled by women themselves, children's nutritional status is better, even in very poor household.

About six in every ten children in the study were put to the breast within the first one hour of being born. This figure is actually higher than what other studies have reported with about three (32 percent) in every ten children been initiated to breastfeeding within the first one hour of been born (Girmay et al, 2010). Disaggregated by residences and mothers educational levels, more rural children and those whose mothers had reached higher education initiated breastfeeding within the first one hour compared to those in urban areas and whose mothers had lower educational levels respectively. Research has shown that, optimal infant and young child feeding-initiation of breastfeeding within one hour of birth, exclusive breast-feeding for the first six months of the Child's life and continued breastfeeding until the child is at least 2 years old, together with age-appropriate, nutritionally adequate and safe complementary foods-can have a major impact on child survival, health, brain and motor development. It also has the potential to prevent an estimated 19 percent of all under five deaths in the developing world, more than any other preventive intervention (UNICEF, 2009;

WHO, 2010). Besides the foregoing point, with regard to conditions that normally exists in developing countries, breastfed children are at least six times more likely to survive in the early months than non-breastfed children; in the first six months of life they are 6 times less likely to die from diarrhoea and 24 times less likely to die from acute respiratory infection (UNICEF, 2009). This risk is reduced because colostrum, the first milk, and breast-milk contain a large number of protective factors that provide passive and active protection to a wide variety of known pathogens. Colostrum is particularly rich in these protective factors and its ingestion within the first hour of life prevents malnutrition (morbidity) and neonatal mortality.

Dietary diversification is one of the underlying determinant in our adapted framework that helps enhance access, utilization and intake of the much needed nutrients and minerals most especially the locally available foods to the benefit of the children especially those who are from the most vulnerable homes and cannot manage to buy from the modern markets. In spite of enhancing diets of infants and young children being a challenge because of their high nutrient requirement, its effect on body composition, growth and cognitive functioning is of importance to the children below the age of five. This study reveals that, statistically significant relationships between mothers DDS and wasting, underweight and stunting. Studies have shown that children whose mothers have a positive deviant (good dietary diversity score) their children also tend to have a good dietary diversity score meaning that mothers who are properly nourished also tend to have properly nourished children as they feed their children a variety of food items from the different food groups (Christina et al, 2008). Thus, as indicated by the adapted UNICEF conceptual framework in this study, once the underlying determinants of malnutrition are improved upon, such as increased food and nutrition security among women and children, the risks of poor dietary intake and

health which may manifest into poor nutritional status among children are actually minimised.

The result of the survey further reveals, children whose mothers had received Vitamin A post partum (2 months after delivery), drugs for intestinal worms and were given or bought iron tablets/syrup during pregnancy were less likely to be wasted, underweight and stunted. These results are in line with what Sumonkanti et al found in a national wide Bangladesh DHS in 2008 were the Vitamin A capsule received by the mother had independent effect ($p < 0.05$) on the child chronic malnutrition (stunting). Thus indicating that children whose mothers had received supplements and malaria prophylaxis exhibited good nutritional status than those who did not received.

One of the major finding of this study is that of the overall 47% stunting prevalence as indicated in this study (44.8 percent are aged 6 – 23 months) meaning that 21 percent of the overall stunting prevalence in Zambia are are below 24 months. This presents a sad scenario for the future population of Zambia in terms of malnutrition levels because studies have shown that undernutrition starts before birth because women's nutrition during pregnancy is closely linked to birth outcomes. Therefore, we reject the null hypothesis and accept the alternative which states that children aged 6 – 23 months of age contribute more to the overall under-5 stunting levels than those 24 months and above.

Stunting is also passed on between generations: stunted mothers tend to have children with low birth weight, who are likely to remain stunted. Because of their increased nutrition needs and greater vulnerability between conception and 2 years of age, lack of access to an adequate diet for a couple of months or more deprives children of essential nutrients, leading to micronutrient deficiencies, constrained development and stunting. Once the children reach 2 years of age, most of this damage cannot be undone.

According to the Lancets series on maternal and child undernutrition, conditions such as stunting cause irreplaceable harm by impeding physical growth and if followed by rapid weight gain in 3 – 5 years age range, this increases the risk of chronic disease later in life. Children who are stunted have also shown to complete fewer years of schooling and earn less income as adults, hindering their cognitive development and economic potential. Lower income, poor health, and reduced access to proper nutrition then continue to impact the health of children born into the next generation, establishing a repetitive cycle. Therefore, providing pregnant and lactating women and children under 2 with age-adequate diets that include essential nutrients as well as sufficient calories is thus a pre-requisite for saving lives and protecting and improving livelihoods. Micronutrient deficiencies must be prevented among all age groups because of their impact on immune system and hence morbidity and mortality.

6.2 Conclusions

Evidence from this study indicates that, maternal characteristics have got statistically significant influence on the nutritional status of children under-five year of age in Zambia and all the forms of malnutrition are still very high in the country. Our study shows that women with better maternal characteristics by following our adapted conceptual framework (looking at both underlying and immediate determinants) tend to have children with better nutritional status because they are have control over resources in their own households, have access to better health services (especially those in urban areas), have access to information, education and communication materials in relation to food and nutrition (such, good IDDS, exclusive breastfeeding, appropriate complementary feeding etc.). Thus, these factors evidently work to improve children's dietary intakes or health thus improving their nutritional status. The study has also shown that women's status has its strongest positive effect on prenatal and birthing care for women, and some aspects of breastfeeding and complementary feeding of children and on many caring practices for women and children that are vital to children's growth and development.

Furthermore, improvements in women's relative decision making power have a strong influence on both long-term and short-term nutritional status, leading to reductions in both stunting and wasting (IFPRI, 2002). The study also finds that increases in women's decision making power relative to men's have a powerful positive effect on child nutritional status because they improve a wide range of caring practices for women and children. These include prenatal and birthing care for women; complementary feeding of children, including timely introduction, food quality, and feeding frequency; timely initiation of breastfeeding; treatment of illness of children; immunization of children; and quality of substitute caretakers for children. Evidently,

the more decision making power a woman has relative to her husband, the more actions are taken to improve care for the woman herself and for her children.

There are strong differences in the impact of women's status on child nutritional status between those in upper socio-economic status and those in the lower socio-economic status. Other studies have shown that when women's status is raised in lower (poor, poorer and middle) quintile households, it has a greater positive impact on child nutritional status than when women's status is raised in upper (rich and richer) quintile households. Women's ability to influence decisions over the allocation of economic resources is apparently more important for children's nutrition when those resources are scarce.

In addition, this study also found that under-five malnutrition has got a lot of causes depending on the type of malnutrition that a child is suffering from apart from maternal characteristics having the major influence on the odds of Global Acute Malnutrition (GAM), underweight and chronic malnutrition among children under five. It was found that there is a strong relationship between maternal and child nutritional status (BMI). This implies that there is actually an intergenerational link between maternal and under-five nutritional status. This therefore, indicates that actions towards improving nutritional status of children should always be integrated in maternal health services for effective utilisation of scarce resources and to reduce the intergenerational link (mother-child) of undernutrition.

Furthermore, apart from maternal characteristics such as (mothers wealth index, receiving vitamin A 8 weeks post partum, education Body Mass Index, Individual Dietary Diversity Score, type of place of residence, number of antenatal visits (as a proxy to health services) and household size having a significant influence on the odds of weight-for-height, weight-for-age and height-for-age, the study also reveals that age

in months of the child and sex are among the major determinants of wasting, underweight and stunting in children 6 – 59 months of age. For example, from 12 months of age onwards and were higher in rural areas, the risks of a child being underweight or stunted were very high. This suggests that interventions targeted at improving under five nutritional status should not only start before and during pregnancy of the mother, but should also continue even after the mother delivers her baby by empowering women especially in rural areas to minimize rural-urban differentials with skills of optimal parental caring practices and increasing accessibility of health services (such as IEC materials on infant and young child feeding, family planning etc.) as closer to the most vulnerable as possible for it will improve both mothers nutritional status and that of the child. Similarly, findings have also shown that women's autonomy in deciding on how their income is used is an important factor in determining the nutritional status of children. Therefore supporting of institutions seeking to empower rural women could be an important intervention to improve both household and child nutritional status by having a diversified diet. In addition, there is also need to explicate factors that place boy children at greater risk of malnutrition compared to girl child.

Our study further concludes that, size of child at birth, decision making by women over her income, number of children in the past three years, availability of water and sanitation facilities were the independent predictors of wasting, underweight and stunting in children 6 -59 months of age. Therefore, the improvement in the nutritional status of the children requires improvement in the level of mother's education and nutrition, improving household conditions, and enhancement of the coverage of health services (Mahgoud, 2006). Therefore, these study findings imply that all efforts aiming at redressing under-5 malnutrition should focus on factors associated with development

outcomes such as maternal income, education, and the creation of employment and other income generating activities without compromising on child feeding practices such as exclusive breastfeeding.

In addition, the prevalence of stunting among children 6 – 23 months contribute about half the number of children to the overall stunting levels in the country implying that once these children reach the age of two years the damage cannot undone and will end up as stunted adults hence the persistent chronic levels of stunting being experienced by the country. Therefore, further research on the determinants of stunting among this age group is suggested with specific emphasis on rural urban differentials and child feeding practices.

6.3 Policy Implications

This last section discusses the implications of these findings for policy interventions. The discussion is divided into three targeted categories namely policy makers, potential clients and the community at large. It concludes by looking the importance of having a fully fledged food and nutrition sector strategic plan to redress the problem of malnutrition in children less than five years.

6.3.1 Policy Makers

Based on findings from this and other related studies, it can be noted that malnutrition is very high in Zambia. Therefore, it implies that measures targeted at improving under-five malnutrition status should not be taken in isolation but should include improvements in maternal nutritional status so as to break the generational link of poor nutritional status at all societal levels in Zambia. This is because under-five malnutrition begins just when the child is conceived and once the nutritional status of the mother is compromised (poor nutrient intake) during and after pregnancy (low birth weight) even the baby born will be most likely be malnourished.

The study findings also reveal that malnutrition is high among women with low education levels. Therefore, a deliberate policy on increasing literacy levels among the women particularly those in rural areas may prove to be a success as it is widely recognised that education enhances acquisition of knowledge, creates greater awareness among women through increased access to health services especially on nutrition which equips women to make sound decisions especially with regard to their health and that of her child by practicing optimal parental care to her child which in turn may reduce low birth weights in children.

In addition, the study also revealed that children whose mothers' wealth indexes were poorest, poorer and middle exhibited poor nutritional status compared to those whose wealth index is richer and richest. Therefore, there is need to support institutions that seeks to empower women through job creation and investment opportunities such as, provision of soft (credit) loans which instils a sense of responsibility by: making decisions on how to best contribute to their own well being; accessing better health services; providing quality diets for their children for optimal growth and improved nutritional status; and lastly, contribute to rapid economic growth at the national level.

It is also important to note that: Childs' sex; age in months; size at birth; birth order; and previous interval had some influence on wasting, underweight and stunting in children in Zambia. Therefore, this suggests that efforts should be made so that the interventions that are being provided by the Zambian government and other non-governmental organizations need to be responsive towards these explanatory variables if reasonable reductions in the current levels of malnutrition especially stunting is to be realised. For example appropriate complementary feeds should be only introduced after a child reaches six months and this will be the only way as to how stunting even in children aged 6 – 23 months will be reversed as it still remains very high in the country. There is also need to expand and enhance integration of high impact maternal and child nutrition interventions focusing on the First 1000 Most Critical Days "from conception up to 24 months of age). This may involve development of a nation-wide programme to be designed with broad cross sector and civil society participation and rapid but phased out implementation supported by well-designed monitoring and communication support elements. In addition to the above, mandatory fortification of widely consumed foods such as maize meal with micronutrients such as Vitamin A would prove as a

success. This is because as shown by our findings, there is poor diet diversification among women of child bearing and children most especially those in rural areas.

6.3.2 Potential Clients

Our findings document that only five in every ten children aged 6 – 59 months are initiated to breastfeeding within an hour. This late initiation usually leaves an enduring legacy of an elevated risk of diarrhoea during infancy. These observations underscore the need to better understand the maternal (women aged 15 – 49 years) beliefs about breastfeeding practices in the days immediately after birth and to devise interventions specifically targeted to remedy the problem of late initiation. Promotion of breastfeeding should be supplemented by promotion of initiation of breastfeeding at birth especially for mothers to be.

Other studies have also shown that existing primary healthcare facilities place considerable emphasis on nutrition promotion for children under five through infant and young child feeding during under-5 clinics etc., there is often less emphasis on nutrition interventions for maternal feeding practices, adolescent women who are potential mothers to be and if health related problems are allowed to affect their nutritional status, they may miss the opportunity of catching up on normal growth and development. Given such a background, it would appear that greater attention to such health related needs of young women and adolescents is necessary if malnutrition in children under-5 is to be fully and effectively tackled in Zambia.

6.3.3 Community at Large

Our findings confirmed that malnutrition is still very high in rural areas compared to urban. Therefore, to reduce these rural-urban differentials in under-five malnutrition, there is need for increased diet diversification by promoting consumption of locally available foods rich in minerals and nutrients at community level which have got little

cost but provides the necessary nutritional benefits for the rural women and children. However, this can only be done if their increased Information, Communication and Education on food and nutrition activities even at community level.

In conclusion, the cross‑cutting nature of nutrition would suggest that advocacy is required to generate greater leadership and operational commitment, better cross sector collaboration and greater levels of resource commitment from both government and other cooperating partners to improving maternal health and nutrition. Such advocacy needs to be evidence-based, drawing primarily on information gained through research, strategically targeted, planned, and implemented on an on-going basis. The responsibility for such strategic advocacy rests with each stakeholder responsible for and committed to improving under-five nutritional status in Zambia. This is because the extent of the effects of different maternal characteristics on wasting, underweight and stunting among children depended on the location of residence, sex and age of children, household headship, birth weight, BMI, marital status, diet diversity scores, environmental factors and wealth index. Thus, decision makers will need to think contextually to deal with factors influencing these three nutritional indices, rather than employing a ‘one size fits all’ approach. A single solution to the national problem of low malnutrition may lead to a waste of resources, as it may be effective for a limited number of cases/areas only.

Annexure

Annex 1. Group Statistics for WHZ, WAZ and HAZ by Sex of the Child

Indicator	Sex	N	Mean	Std. Deviation	Std. Error Mean
WHZ	Boys	2291	0.181	1.374	0.029
	Girls	2401	0.205	1.315	0.027
HAZ	Boys	2224	-1.924	1.475	0.031
	Girls	2316	-1.714	1.438	0.030
WAZ	Boys	2369	-0.946	1.190	0.024
	Girls	2478	-0.823	1.159	0.023

Annex 2. Independent Samples for WHZ, WAZ and HAZ by Sex of the Child

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% C.I. of the Difference	
									Lower	Upper
WHZ	Equal variances not assumed	7.171	0.007	-0.609	4652	0.543	-0.024	0.039	-0.101	0.053
HAZ	Equal variances assumed	1.321	0.251	-4.870	4538	0.000	-0.211	0.043	-0.295	-0.126
WAZ	Equal variances assumed	3.044	0.081	-3.659	4845	0.000	-0.123	0.034	-0.190	-0.057

Annex 3: Group statistics for Mothers Dietary Diversity Score by type of place of residence

Indicator	Type of place of residence	N	Mean	Std. Deviation	Std. Error Mean
Mothers Dietary Diversity Score for	Urban	1230	6.280	2.116	0.060
	Rural	2948	4.790	2.035	0.037

Annex 4: Independent Samples Test for Mothers Dietary Diversity Score by type of place of residence

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% C.I. of the Difference	
									Lower	Upper
Dietary Diversity Score for Mothers	Equal variances assumed	4.48	0.03	21.28	4176	0.00	1.49	0.07	1.35	1.62
	Equal variances not assumed			20.94	2223	0.00	1.49	0.07	1.35	1.63

Annex 5: Bivariate correlation between mothers Body Mass Index and WHZ, WAZ and HAZ scores

WHZ & Mothers BMI			
		WHZ-score	Mothers BMI
WHZ	Pearson Correlation	1	0.120**
	Sig. (2-tailed)		0.000
	N	4692	4686
Mothers BMI	Pearson Correlation	0.120**	1
	Sig. (2-tailed)	0.000	
	N	4686	4848
WAZ & Mothers BMI			
		WAZ-scores	Mothers BMI
WAZ	Pearson Correlation	1	0.163**
	Sig. (2-tailed)		0.000
	N	4847	4838
Mothers BMI	Pearson Correlation	0.163**	1
	Sig. (2-tailed)	0.000	
	N	4838	4848
HAZ & Mothers BMI			
		HAZ-scores	Mothers BMI
HAZ	Pearson Correlation	1	0.074**
	Sig. (2-tailed)		0.000
	N	4540	4533
Mothers BMI	Pearson Correlation	0.074**	1
	Sig. (2-tailed)	0.000	
	N	4533	4848

***Correlation is significant at the 0.01 level (2-tailed).*

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