Predictors of undernutrition in children: a case study of Kwahu South District (KSD) in Ghana

BY

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Ghana

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A thesis submitted in partial fulfillment of the requirement for the degree of Master of Public Health

By

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Signature

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Glossary

Body Mass Index (BMI): is a measure of weight of a mother and is defined as weight in kilograms (Kg) divided by height squared in metres (kg/m2). Mothers with below 18.55kg/m2 are classified as thin whereas mothers within 18.5kg/m2 to 24.9kg/m2 are classified as normal. Above 24.9kg/m2 is classified as overweight and 29.9kg/m2 is classified as obese.

Height: Women with a height of below 145 cm in this study are deemed to be of short stature hence stunted.

Food insecurity: refers to the inability of people to live fulfilling lives regarding the type of food they eat, in what quantity, when and how they get what they want to eat.

Food security: is the opposite of food insecurity

Hunger: a situation when food and micronutrient intake is below that required

Stunting: also referred to as chronic undernutrition is indicative of shortness in relative to age; that is an inability to grow tall. The cut off points for stunting are below minus two standard deviation (-2SD) from the mean height-for-age measures of a standard reference population for moderate stunting and below -3SD for severely stunted.

Malnutrition: refers to an uneven intake of nutrients.

Wasting: also referred to as acute undernutrition is indicative of thinness relative to height; that is small body size. The cut-off points are below minus two standard deviation (-2SD) from mean weight-for-height measures of a standard reference population for moderate wasting and below -3SD for severe wasting.

Undernutrition: refers to the interaction between low intake of nutrients, infections and poor caring practices.

Underweight: Below -2SD indicates moderate underweight and below -3SD indicates severe underweight

Undernourishment: is when food intake is inadequate to support regular bodily functions and is used in measuring food insecurity

Based on: WHO 2007; UNICEF 2009, 2013; UNSCN 6th Report; Black et al. 2008

List of Acronym and Abbreviations

ADB	African Development Bank
AHDR	African Human Development Report
AHWO	African Health Workforce Observatory
ARI	Acute Respiratory Infection
CHPS	Community-based Health Planning and Services
CI	Confidence Interval
CSOs	Civil Society Organisations
DALYS	Disability Adjusted Life Years
DHMT	District Health Management Team
FAO	Food And Agriculture Organization
GDHS	Ghana Demographic Health Survey
GDP	Gross Domestic Product
GHS	Ghana Health Service
GoG	Government of Ghana
GSS	Ghana Statistical Service
HIV	Human Immune Virus
IMNCI	Integrated Management of Neonatal and Childhood Illnesses
KSD	Kwahu South District
KSDHA	Kwahu South District Health Administration
LBW	Low Birth-Weight
MDG	Millennium Development Goal
MICS	Multiple Indicator Cluster Survey
MOH	Ministry of Health
NCDs	Non-Communicable Diseases
NDPC	National Development Planning Commission
NGOs	Non-Governmental Organisations
NIDs	National Immunization Days
OR	Odds Ratio
PEM	Protein Energy Malnutrition
RHA	Regional Health Administration
SA	South Asia
SAM	Severe Acute Malnutrition
SSA	Sub-Saharan Africa
SD	Standard Deviation
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
UNSCN	United Nations Systems Standing Committee On Nutrition
WB	World Bank
WFP	World Food Programme
WHO	World Health Organization
HTP	Harmonized Training Package

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To the Glory of God

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Abstract

Introduction

Kwahu South District, like most other districts in Ghana is saddled with problems of undernutrition and ill health. Determinants of undernutrition are contextual, thereby requiring local solutions. This study serves to provide evidence to inform decision making and nutrition programming in Kwahu South District of Ghana.

Methods

Data collected from a cross sectional survey on children 6-59 months old was analyzed to determine associations between stunting and wasting and selected predictors.

Results

The main findings are: The risk of stunting in children who are 36 months and above is 11 times higher than children who are between 6-11 months (***p<0.005***). A mother being overweight was a protective factor against her child being stunted (OR=0.15, 95% CI [0.02-0.82], ***p<0.02***). Children of unemployed women were 3 more at risk to be stunted to be stunted than children of women who were traders (OR=3.38, 95% CI 0.31-36.07). Male children were about 3 times more likely to be wasted than female children (OR=3.20, 95% CI [1.02-10.06], p<0.04). Children whose mothers were farmers were 2 times more likely to be wasted than children whose mothers were traders (OR=2.20, 95% CI 0.58-8.32).

Conclusion

The causes of undernutrition in KSD include cuts across all the three levels of determinants. This requires a comprehensive approach in providing both nutrition specific and nutrition sensitive interventions.

Recommendation

Recommendations to the District Health Administration are: it should strengthen the management of acute undernutritionin at the CHPS level; and intensify outreach programmes on sanitation and hygiene.

Keywords: Undernutrition, stunting, wasting, children, women, infections, determinants, prevalence, intergenerational, Ghana, Kwahu South District

Word Count: 11, 781

Introduction

My experience in the health sector in Ghana began in 2007 after my first degree. I was posted to the Dodowa Health Research Center as national service personnel. I worked in the field department on a WHO pilot programme on the treatment of malaria and pneumonia in children Under 5 years using trained Community-Based Agents. I joined the Center for Health and Social Services (CHeSS) as a junior research assistant in 2009. In my time at CHeSS I have been part of several research and evaluation projects on the health sector of Ghana.

Many children continue to die and together with women are trapped in a vicious cycle of undernutrition and infections. Despite trends showing decreasing prevalence of stunting and wasting in Ghana, protein energy malnutrition remain pervasive in children and women. The objective of this thesis is to determine the association between stunting and wasting in children 6-59 months and the determining factors and make recommendations to the Kwahu South District Health Administration to inform evidence based nutrition and related health interventions. By this, I hope to also contribute to the academic literature on nutrition. This thesis consists of two parts, literature review and analysis of secondary data. The data for analysis was by courtesy of the Kwahu South District Health Administration.

The thesis is organized in the following manner: Chapter one gives an introduction to Ghana and the study area. Chapter two describes the problem statement, justification and study objectives. Undernutrition is further explored in chapter three, global trends, trends in Ghana and the determinants of undernutrition as presented. The variables of analysis and the results from the analysis are presented in chapter four. The results are dicussed in chapter five and recommendations proposed to Kwahu South District Health Administration.

Chapter 1

Figure 1: Map of Ghana

(UNDP 2013)

1.1 Overview of Ghana

Figure 1 shows the map of Ghana. Ghana has a population of 24.65 million people with 48.8% being males and 51.2% females (GSS, GHS & ICF MACRO2012). Ghana is divided into ten administrative regions. There are 216 districts functioning under the regions (Ghana Districts 2013). The Gross Domestic Product (GDP) of Ghana is US $39.20 billion (World Bank 2011) and as shown in Table 1 together with selected human development indicators. The service sector has overtaken the agriculture sector as the leading contributor to GDP (ADB 2012).

Table 1: Trends in Ghana's economic and human development indicators

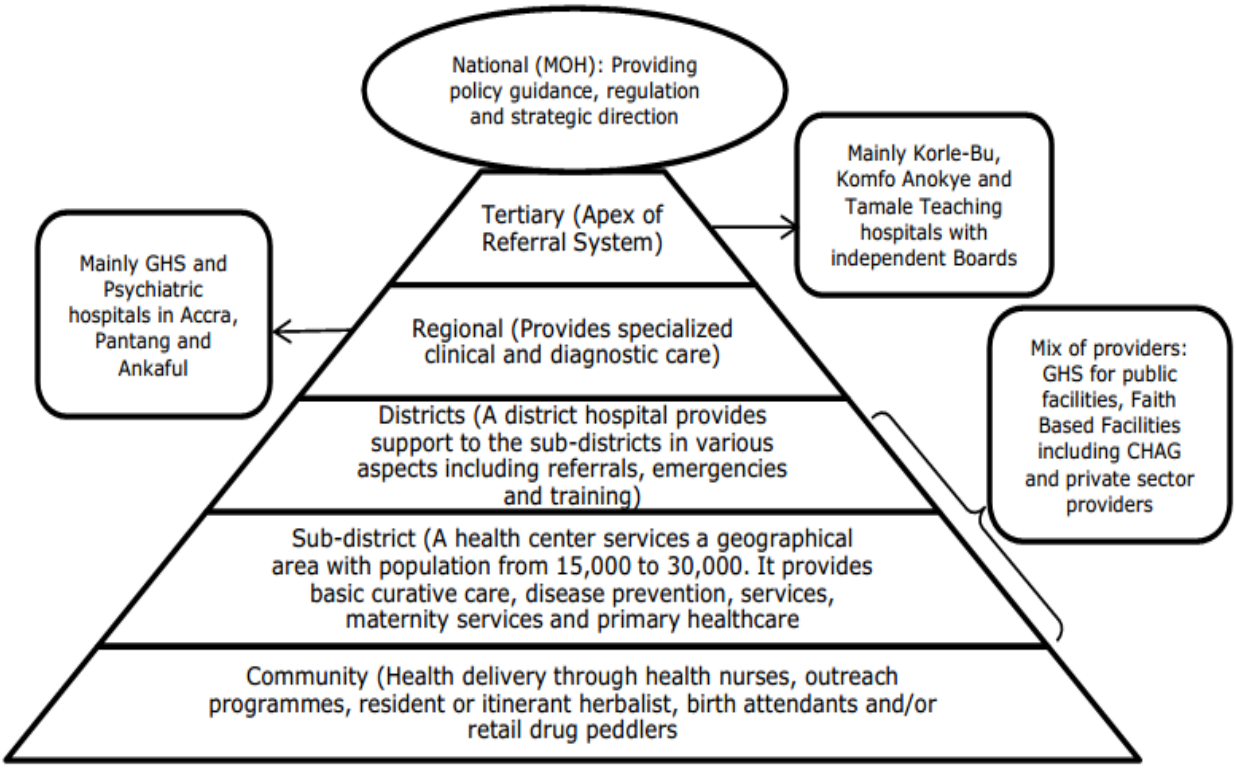
INDICATORS	YEARS ($ & %)			Source
	2009	2010	2011	
GNI per capita, PPP	1,540	1,610	1,810	WB
GDP	25,978,537,279	32,174,839,713	39,199,656,051	WB
GDP growth (annual %)	4	8	14	WB
Life expectancy at birth, total (years)	63	64	64	WB

Indicator	%	Year	Source
Poverty headcount ratio at national poverty line (% of population)	28.5%	2006	WB
Improved water source, rural (% of rural population with access)	80%	2010	WB
School enrollment, primary (% gross)	110%	2012	WB
Adult literacy rate, both sexes (% aged 15 and above)	67.3	2013	UNDP
Expenditure on health, public (% of GDP)	3.1	2013	UNDP
Public expenditure on education (% of GDP)	5.5	2013	UNDP

Indicator		Year	Source
Human development Index	0.558	2013	UNDP
Non-income Human development Index	0.646	2013	
Gender Inequality Index	0.565	2013	UNDP
Multidimensional Poverty Index	31.2 (Based on 2008 data)	2013	UNDP

Management of the health system in Ghana is at three levels and services are organized at five levels. The national level is the apex of this system and is illustrated in Figure 2. The Ministry of Health (MOH) is responsible for the overall health sector performance; the Teaching Hospitals provide tertiary services; Ghana Health Service (GHS) provides care at the primary and secondary levels and is devolved at the lower levels into Regional Health Administrations (RHAs) and District Health Management Teams (DHMTs). The Community-based Health Planning and Services (CHPS) system is designed to increase community involvement in planning and service delivery (AHWO 2010; Gyapong et al. 2007).

Figure 2: Management and organization of health services in Ghana



(Seddoh, Adjei & Nazzar cited in Gyapong et al. 2007)

Communicable diseases – accounts for 57% of disease burden - together with poor reproductive health, malnutrition, and gastroenteritis and birth injury contribute highest to the disease burden in Ghana. Malaria is the main cause of morbidity and mortality. Child health indicators are improving faster than that of maternal as shown in Table 2. Cardiovascular diseases, diabetes and road traffic accidents are the leading non communicable diseases (NCDs) in Ghana (AHWO 2010; Gyapong et al. 2007).

Table 2: Selected health indicators for Ghana

Indicator	Year	Rate	Source
Under 5 Mortality Rate (/1000 live births)	80	2009	GSS
Infant Mortality Rate (/1000 live births)	50	2009	GSS
Neonatal Mortality Rate (/1000 live births)	30	2009	GSS
Maternal Mortality Rate (/100,000 live births)	451	2009	GSS
Institutional Maternal Mortality Rate (per 1000 live births)	173.8	2011	GHS

Indicator	2009	2010	2011	Source
ANC coverage	92.1%	93.3%	91.3%	GHS
% Deliveries attended by a skilled attendant	45.6%	49.5%	52.23%	GHS
PNC coverage	56.0%	61.6%	64.7%	GHS
Penta-3 coverage	89.3%	87.1%	85.86%	GHS
Measles coverage	89.1%	87.7%	86.33%	GHS

1.2 Overview of Kwahu South District (KSD)

1.2.1 Geography and demography KSD

Kwahu South District (KSD) is located in the Eastern Region of Ghana, along the Kwahu ridge of mountains with an elevation of 2,586 feet above sea level (KSDHA, 2011). The size of the district is 1,462 kilometers square (Ghana Districts, 2013). Annual rainfall in the district is between 1,670 to 1,799 millimeters. Most parts of the district are heavily forested (KSDHA, 2011). In 2010, the population of KSD was 69,757 (Ghana Districts, 2013). Most of the communities in the district are located on top of the ridge. The district is mainly rural with a few semi-urban centers. Majority of dwellers in the district are indigents, 66% Kwahus. The other dominant ethnic groups are the Asantes (17%) and the Ewe (15%). Most people in Kwahu South are Christians (89.5%) and 3.6% are Muslims and Traditionalists and the remaining 6.9% do not practice any faith (KSDHA 2011).

1.2.2 Economy of KSD

Fifty-four percent (54%) of the labour force in the district is engaged in subsistence farming; and higher, 71.8%, in the rural areas of the district. Crops grown are plantain, maize, yam cassava, onions, pepper and tomatoes. The other important sectors are the service sector (42.3%) and industry (7.4%). Public sector workers comprise 15.5% of the working population of the district. The Afram River, a tributary of the Volta Lake, provides opportunities for tilapia farming (KSDHA 2011).

1.2.3 Health in KSD

The disease burden of KSD in order of magnitude is malaria, diarrhoea, acute respiratory infections (ARI), skin diseases, intestinal worms, anemia, malnutrition, road traffic accidents and others. In total there are sixteen government health facilities in the district; one district hospital, six health centers and nine CHPS zones. The sixteen health facilities combined have a total bed capacity of 229. KSD has a fair balance of health workers as shown in Table 3 below. The District Health Administration (DHA) has 24 personnel (KSDHA 2011).

Table 3: Health worker-population ratio of KSD

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
No. of Doctors	4	5	5	4	4	6
Doctor pop. ratio	1:33,576	1:34,632	1:32,409	1:21,838	1:22,143	1:14,969
No. of Nurses	156	160	160	144	135	118
Nurse pop. ratio	1:1,076	1:1,082	1:1,082	1:606	1:656	1:761
No. of Medical Assistants	2	5	7	3	3	4
Medical Assistant pop. Ratio	1:85,385	1:34,632	1:32,409	1:29,117	1:29,524	1:22,453
No. of paramedics	222	202	204	197	161	127
Total	384	372	376	348	303	255
Source: KSDHA, 2011						

As a devolved agency, KSDHA derives its mission from the GHS - to provide quality affordable health care to all people living in the district. Its focus is to expand coverage of priority health services to all communities in the district (KSDHA 2011).

Chapter 2

2.1 Problem statement

Child and maternal undernutrition remain high in low and middle-income countries, accounting for substantial proportion of deaths and overall disease burden. Globally, 3 to 5 million deaths and 11% of the total disease burden as measured by disability-adjusted life-years (DALYs) are due to child and maternal undernutrition. Similarly, the proportion of deaths and DALYs in children younger than five years due to stunting, severe wasting and intrauterine growth restriction represents the largest percentage of risk factors in this age group (Black et al. 2008).

In Ghana, undernutrition is an underlying cause in 40% of Under 5 mortality (GHS 2013). About 12,000 children die yearly as a result of undernutrition related complications (Ghana News Agency 2012). The loss in productivity potentials of Ghanaians due to the life time effects of stunting, Low Birth Weight (LBW) and anaemia is projected to be US $41.0 billion (GHS 2013). The national average for stunting in Under 5s is 28% and 10% are severely stunted. Prevalence of wasting for children Under 5 is 9% and 14% are underweight. Feeding practices for children Under 5 in Ghana are inappropriate and less frequent. For children 6-23 months, only 36% are being fed appropriately and 46% receive the recommended number of meals per day (GSS, GHS & ICF MACRO2009).

Eastern Region has some of the highest figures (stunting prevalence of 38%), higher than national average, of undernutrition in Ghana. Against this background, KSD presents an interesting case study; weight-for-age data generated from growth monitoring sessions placed undernutrition rates for children 0-59 months at 29% (KSDHA 2011).

2.2 Justification

Good nutrition is a determinant of life in terms of the number of years lived and of the quality of life lived during those years (Save the Children 2012a). Good nutrition is equated to prosperity for a nation and its citizens. Optimally nourished children (including women), presumably, enjoy good health in the present and have higher prospects of living fulfilling future

Note

AT the time of writing this paper, there are two national survey documents that had measured nutrition status of children, the Ghana Demographic Health Survey (GDHS) 2008 and the Multiple Indicator Cluster Survey (MICS) 2011.

We opted to use the GDHS in our problem statement, justification and comparison to our study results because the MICS did not measure one of the variables of interest in our study, mothers nutritional status

lives. Thus, through good nutrition the devastating effects of illnesses and poverty are reduced (UNICEF 2009).

Identifying underlying causes, prioritizing, designing and implementing context specific interventions on combating undernutrition in children Under 5 and women is a step in addressing inequities of access to food and healthcare (Black et al. 2008; UNICEF 2013; UNSCN 6th Report). There are now clearer and effective strategies for preventing undernutrition especially stunting (Bryce et al. 2008; Save the Children 2012b; UICEF 2009; UNSCN 6th Report). Thus, there could not have been a better opportunity for intervening to stop undernutrition than during the first 1000 days of life (Black et al. 2008; UNICEF 2009; UNSCN 6th Report). In KSD, like most other districts in Ghana, data on child nutrition is scant, this therefore makes planning for and executing of targeted interventions very difficult. In view of this, any attempt that seeks to contribute to reducing undernutrition through research is imperative.

2.3 Objectives

2.3.1 General objective

The general objective of this study is to determine the association between nutritional status of children 6-59 months and determining factors and make recommendations to the KSDHA to support nutrition related interventions in the district.

2.3.2 Specific Objectives

I. Describe determinants of undernutrition;
II. Determine the prevalence of stunting and wasting among children 6-59 months in KSD;
III. Determine the association between the nutritional status of children 6-59 months and determining factors in KSD;
IV. Discuss implications of these determinants of undernutrition on nutrition programming in KSD;
V. Make recommendations to the KSDHA based on evidence from the analysis.

2.3.4 Literature review

A literature review was conducted on the determinants of undernutrition. Data was compiled from published peer reviewed literature using Scopus, Google Scholar and Pubmed. The keywords and their combinations used were: malnutrition, undernutrition, stunting, wasting, underweight, Ghana,

determinants, risk factors for undernutrition, undernutrition and infections, immediate causes and basic causes. Only publications in English were selected. There were no restrictions based on the year of publication. Grey literature from the reports and websites of GHS, United Nations Agencies, Non-Governmental Organisation (NGOs) and Development Institutions were also used.

The literature review provided information on the current trends - prevalence and programming – on undernutrition. It also informed our selection of variables for analysis as well as providing evidence for our discussion.

2.3.5 Analysis of data

Data were analyzed from a nutrition survey carried out by KDS in 2011. The World Health Organization (WHO) child growth standards of 2007 were used as reference and presented in the glossary. The survey was carried out among a systematic randomly selected sample of 426 children (from a total of 16,166 children aged 6-59 months identified during the March 2010 NID). Data collection took place in August 2011. STATA 10 was used for a regression analysis in univariate and multivariate models. Statistical significance was set at P-value <0.05. Variables were included in the multivariate analysis if they had a probability of 0.1. However, variables that did not meet this condition were selected if they were directly related to or could inform the objectives of our study. Proportions are used to describe selected characteristics of the outcome and explanatory variables. Odd Ratios (OR), P-values, Confidence Intervals (CI) are used to describe associations and correlations.

2.3.6 Conceptual framework on the determinants of undernutrition

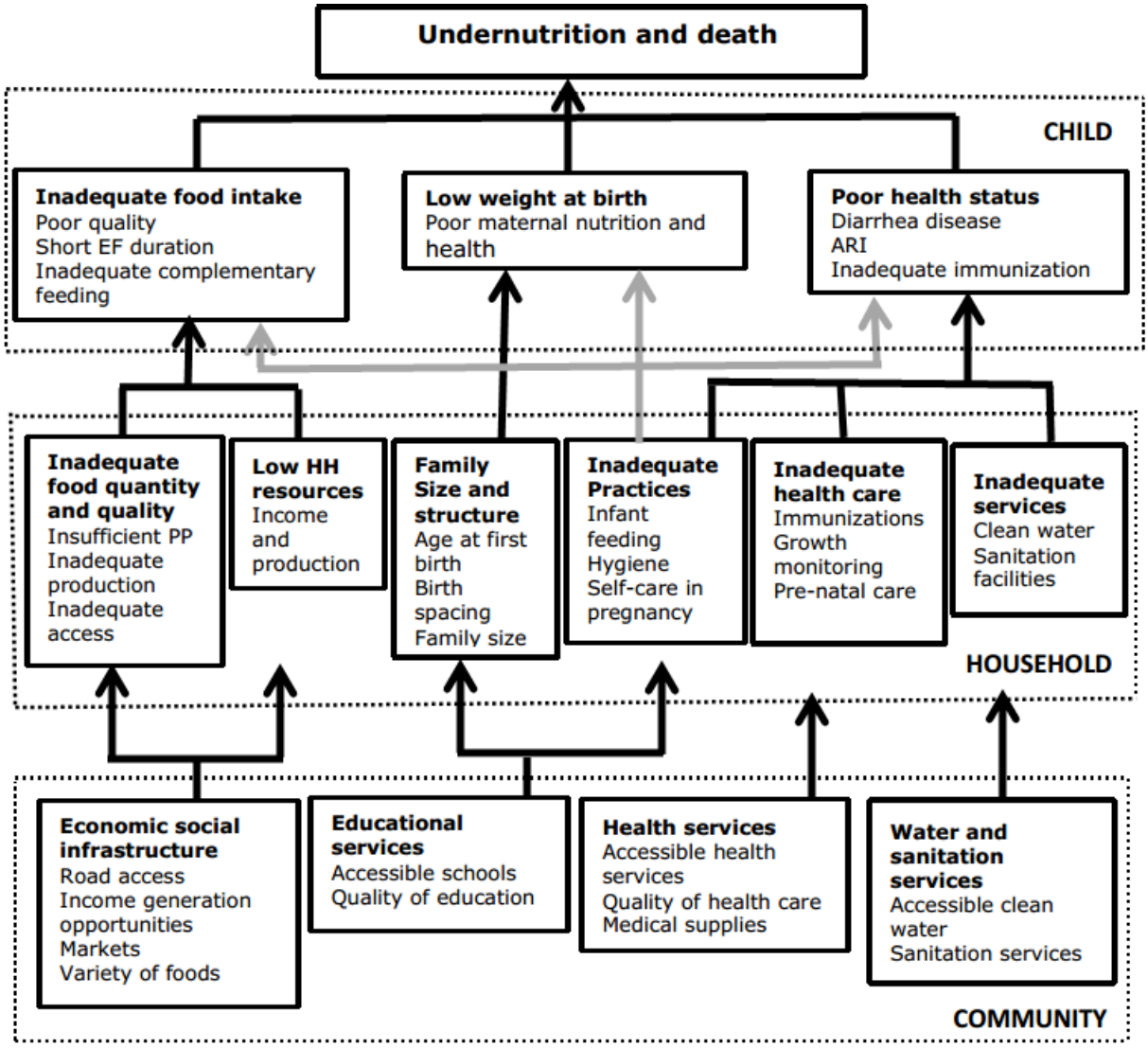
Undernutrition cannot simply be pinpointed to a single cause. It is to this end that United Nations Children's Fund (UNICEF) developed a framework to aid in the analysis and better understanding of undernutrition and the UNICEF framework is generally accepted as the reference model (UNICEF 2013). This framework has been revised and adapted by various agencies and bodies to suit their purpose. In this paper we adapt the undernutrition framework of World Bank 2007. The framework is a three tier construct and analyses the causes of undernutrition from the perspectives of direct, intermediate and basic factors leading (UNICEF 2013; Benson 2005).

This framework presents undernutrition as a multifaceted problem, occurring contextually and requiring a multi-sectoral approach to solve. It portrays undernutrition as a problem beyond the realm of any one agency or ministry; as a scourge that lies in the domain of both health and non-health

actors (Benson 2005; World Bank 2007). The framework also captures maternal undernutrition as an important factor to ensuring adequate child nutrition. This had been a gap in the original UNICEF conceptual framework (World Bank 2007).

Users of this framework are quick to point out its limitation. Firstly, that this framework is not useful as an assessment tool for it only identifies casual pathways; that the framework does not propose solutions for the casual pathways it has identified (World Bank 2007).

Figure 3: Adapted conceptual framework for the determinants of undernutrition



(World Bank 2007)

2.3.7 Focus of the study

The scope of this study is on undernutrition and in chapters 4 and 5 we focus on determinants of stunting and wasting. We focus on these two measures because underweight is a composite measure and does not provide much information as to what the real condition is.

Chapter 3

3.1 Background to undernutrition

Undernutrition and overnutrition together is generally termed as malnutrition; malnutrition is often used to mean and in place of undernutrition. Undernutrition can occur as macro or micronutrient deficiencies in the form of stunting, wasting, underweight and ailments attributed to vitamin and mineral deficiencies. In these forms undernutrition may lead to death, deformity and disability. Hunger in the form of inadequate food and micronutrients are the result of food insecurity and leads to undernutrition (Black et al. 2008; UNICEF 2009; UNSCN 6th Report; WFP 2009). Nutritional status is ascertained through standardized measurements of physical attributes (including medical examinations) and compared to pre-determined standards of the WHO; the WHO standards are derived from a reference population (Black et al. 2008; UNICEF 2009, 2013; Young & Jaspers, 2009). In this paper we focus exclusively on undernutrition in the form of stunting, wasting and underweight.

Stunting is indicative of short height. It is the effect of a persistent deprivation of essential nutrients (fats, carbohydrates, proteins, zinc, Vitamin A and iron) and frequent episodes of diseases over a long time (Black et al. 2008; Garcia 2012; Young & Jaspers 2009); stunting can occur before birth (Victora et al. 2008; Young & Jaspers 2009). The insufficient supply of nutrients and infections results in mal-development of skeletal and vital organs (Garcia 2012; Save the Children 2012b; Victora et al. 2008). If not detected early, a child may not recover from stunting (Victora et al. 2008; Young & Jaspers 2009).

When a child fails to amass or lose weight, the child is deemed to be wasted; wasting may be a seasonal event, therefore children may recover from this condition quickly (Garcia 2012; Young & Jaspers 2009). Wasting is caused by protein-energy malnutrition (PEM) which arises when children are sub-optimally fed (fats, carbohydrates, proteins, sodium, magnesium, zinc and phosphorus) and this may be due to food shortages. Tissue may be digested by the body to augment for the low nutrient intake. Children between six and twenty-four months are more vulnerable to wasting, and those suffering from diarrhoea and measles are more likely to be wasted (Bhutta et al. 2008; Garcia, 2012; Save the Children 2012b; Young & Jaspers 2009).

Underweight is a combination of stunting and wasting over a period and may not be suggestive of the real condition being either solely thinness or low physique. Determination of underweight involves a process of monitoring through growth charts for it can be an indication of current or past undernutrition (Young & Jaspers 2009). Stunted children may not

necessarily be wasted and vice versa; this is because they have different causes (Black et al. 2008; Garcia 2012; Young and Jaspers 2009).

The choice of underweight as an indicator for measuring MDG 1 has been contested (Morris, Cogill & Uauy 2008) and stunting has emerged as the preferred indicator for measuring undernutrition (Black et al. 2013; UNICEF 2009, 2013; Victora et al. 2008). Decreasing trends in wasting has resulted in generous decreases in underweight prevalence in many countries. The choice for stunting as an indicator is because: it is particularly slow to decrease (Black et al 2013); and it is related with childhood overweight (double burden of malnutrition) and NCDs (Black et al 2013; Victora et al. 2008). The window of Opportunity - that is the period from conception to when a child is two years – is when most of the damage is caused, hence imperative to focus more on this period (Black et al. 2013; Bryce et al. 2008; UNICEF 2009, 2013; Save the Children 2012a)

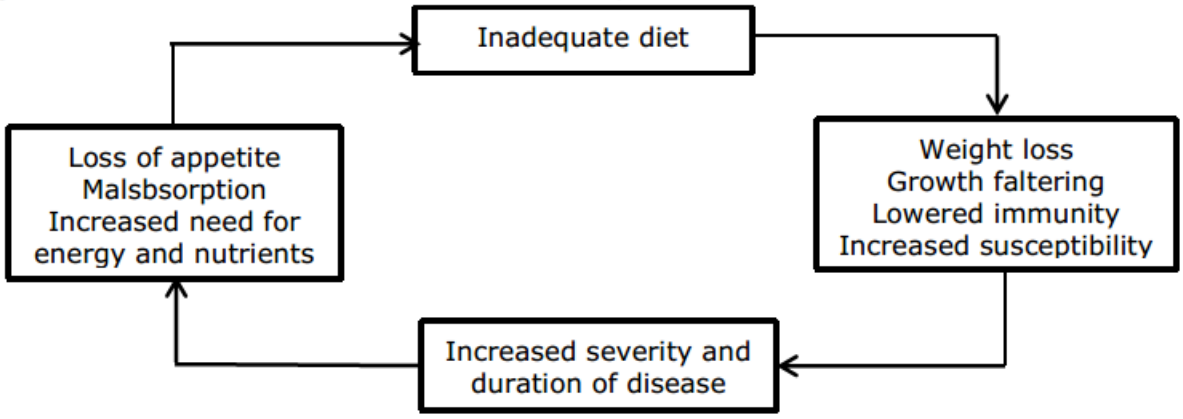
As previously mentioned, stunting starts in the utero, thus, though children especially older children may have optimal weight, past nutritional deficiencies may have been concealed (UNICEF 2009). Also, stunting and wasting in a geographical or family context may be the consequences of existing unfair distribution of resources (Black et al. 2008; UNICEF 2013; Young & Jaspers, 2009). In the 2008 and 2013 editions of The Lancet Series, the Maternal and Child Nutrition Study Group advocates for the use of stunting as the preferred indicator for monitoring undernutrition. It is for these reasons that we exclusively focus on stunting and wasting later on in our data analysis.

3.2 Consequences of undernutrition

Though severe forms of undernutrition may directly lead to death, the interaction of moderate undernutrition with other diseases is noted to result in more deaths; children may also be disabled due to undernutrition. For instance, undernutrition is implicated in 52%, 57% and 61% of all child mortality related to pneumonia, malaria and diarrhoea respectively. Four and six times higher are the risks of death in severely stunted and wasted children (Black et al. 2008; Save the Children, 2012a, 2012b; UNICEF 2009, 2013). Infections in malnourished young children may be lethal – more intense and may take longer time to heal - because at that age they are growing rapidly hence require more nutrients. They become trapped in a cycle of persisting undernutrition and ill health as shown in Figure 4 (Black et al. 2008; UNICEF 2009, 2013). The adverse effects of undernutrition during childhood may continue adulthood in the form of NCDs such as hypertension, heart diseases and diabetes (Bhutta 2013; Black et al. 2013, 2008).

Undernutrition may also result in overweight later in childhood or adulthood in the process of catch up growth. Children, even those under two years, are at risk of amassing extra weight, the body may not be able adjust appropriately biologically to a sudden availability of nutrients (Black et al. 2013; Horton & Lo 2013; Victora et al. 2008). Malnourished children most often are lethargic and docile. This may affect them academically resulting in average performance and may result in discontinuation of education (Black et al. 2008; Save the Children, 2012a, 2012b; UNICEF 2009, 2013;Victora et al. 2008).

Figure 4: The infection-undernutrition cycle



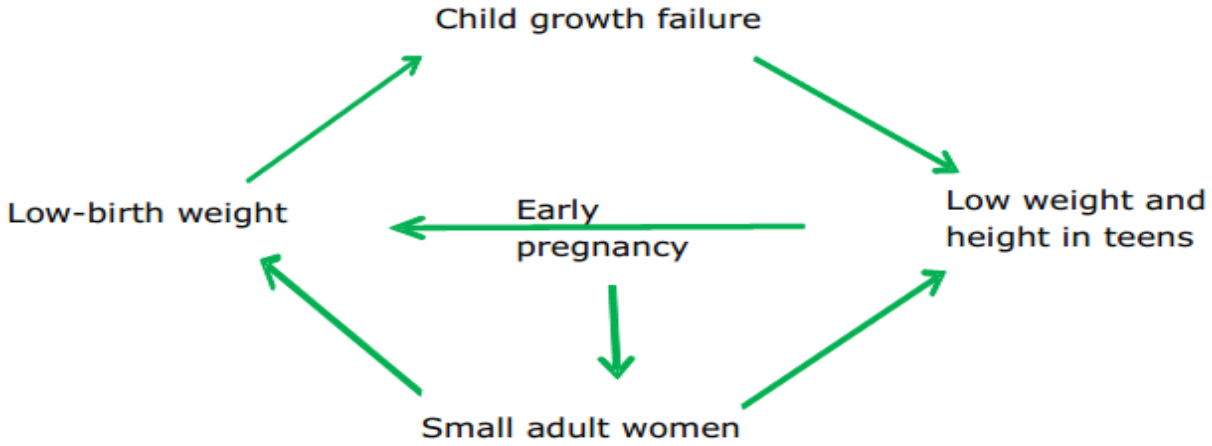
(HTP 2011)

Maternal nutrition is correlated with child nutrition. It is women who conceive, give birth and care for children, thus, anything that adversely affects their health and nutrition is most likely to affect their children as well (Black et al. 2013; Taylor, Dangour & Srinath 2013). Over half of the cases of stunting start from the womb (Black et al. 2013; UNICEF 2009, 2013; UNSCN 6th report). The limited or unavailability of nutrition promotion services and the late uptake of these services by pregnant women in the developing world has been attributed to the high burden of child and maternal undernutrition in these countries (Black et al. 2013).

Undernutrition, mainly due to micronutrient deficiencies, and poor health increases the risk of intergenerational transfer of undernutrition through fetal growth restriction and LBW (Bhutta 2013; Black et al. 2013; Taylor, Dangour & Srinath 2013). This risk is substantially increased in the event of early child bearing during teen years and the effects and consequences are highlighted in Figure 5. The bodies of adolescent girls may not yet be ready for the arduous task of pregnancy and childbirth. They may also be inexperienced hence may not be able to take appropriate care of their babies and themselves. It also follows that young mothers are still mostly dependent on their families for comfort and support. Early child bearing in

adolescents significantly increases the risk of LBW and fetal growth restriction. Undernutrition increases the risk of adverse pregnancy outcomes (Bhutta et al. 2013; Save the Children 2012a, 2009; UNICEF 2013; UNSCN 6th report). Intergenerational undernutrition is the cause of the high proportion of stunted women in the developing world. This link may only be broken by addressing nutritional deficiencies of women in early life, the period before and during pregnancy and addressing early marriage of teen girls (Bhutta 2013; Black et al. 2008; Taylor, Dangour & Srinath 2013; Save the Children 2012a; Victora et al. 2008).

Figure 5: Intergenerational cycle of growth failure



(UNSCN 6th Report)

The economic effects of undernutrition are damaging and broad; the productive potential of a malnourished person is diminished by 22% and $20 to $30 billion of the global economy is lost each year due to malnutrition. High prevalence countries lose 2% to 3% of their GDP annually. The implications of undernutrition on healthcare provision and financing are huge. As previously mentioned of the effects of undernutrition on health and education, semi-skilled or less educated people are likely to earn less and sick workers will require more days off work. These individuals are then also more likely to spend more on health potentially resulting in catastrophic health expenditures (Black et al. 2008; Save the Children 2012a, 2012b; UNICEF 2009, 2013; Victora et al. 2008).

3.3 The global nutrition setting and trends

The target of Millennium Development Goal (MDG) 1 is to eradicate extreme poverty and hunger. Failure to achieve MDG 1 will hinder the achievement of MDG 2 (achieve universal primary education), MDG 4 (reduce child mortality) and MDG 5 (improve maternal health) (UNICEF 2009). In recent times, the nutrition community has witnessed a flurry of activities in terms of programming, direction and leadership, all being the aftermath of the

formation of the Scaling-Up Nutrition (SUN) movement in 2010 (Gillespie et al. 2013; UNICEF 2013). Before then, ideological and institutional politics dictated programming and responses within the nutrition community (Morris, Cogill & Uauy 2008).

Overall, 165 million (26%) children below five years were stunted globally in 2011, the majority (80%) of whom lived in fourteen countries in South Asia (SA) and sub-Saharan Africa (SSA); 39% in SA and 40% in SSA. A 2.1% annual global reduction rate in stunting has been recorded over the past two decades and much of this has been in East Asia, with little seen in SSA. Differences in stunting rates between boys, 42%, and girls, 36%, is more striking in SSA than the other regions of the world. For both moderate and severe wasting, 52 million Under 5s worldwide were affected in 2011; 16% in SA and 9% in SSA. Between 1990 and 2011 the global prevalence of wasting had decreased by 11%, this includes SSA, but the number of wasted children in SSA had actually increased and this has been attributed to a high rate in population growth. Underweight children Under 5 globally were 101 million (16%) in 2011; 59 million (33%) in SA and 30 (21%) million in SSA. Between 1990 and 2011 the global prevalence of underweight has been reduced by 37% (UNICEF 2013).

3.4 Ghana's response

Ghana is a signatory to the SUN movement. Sector policies and strategic documents have always been used to convey the Government of Ghana (GoG) and MOH's position on nutrition (Bahwere et al. 2011; Ghartey 2010). In 2006, the MOH launched it's strategic policy document titled "Creating Wealth through Health". The document prioritizes nutrition and sets to reduce future inequalities in health and economic potentials resulting from undernutrition (Bahwere et al. 2011; GHS 2013; Van de Poel 2007). The Health Sector Medium Term Development Plan (HSMTDP) 2010-2013, details the MOH's current action plan on nutrition. The agriculture sector has focused on food production and food security (GHS 2013). The nutrition department and division of both MOH and GHS respectively coordinate the health sector response and the Ministry of Food and Agriculture (MOFA) has its own coordinating department. Development Partners (DPs), Civil Society Organizations (CSOs) and NGOs are also actively involved in piloting of community based nutrition projects (AHDR 2012; Bahwere et al. 2011; Ghartey 2010).

In recognition of the multifaceted nature of undernutrition, the MOH and the GHS in 2005 introduced the 'Imagine Ghana Free of Malnutrition' strategy to garner support and collaboration from other sectors, partners and CSOs in combating malnutrition (GHS 2013). This strategy paved the way for the piloting and subsequent roll-out of the Community-based Management of

Acute Malnutrition (CMAM) initiative in 2007 to increase access and coverage of nutrition services as illustrated in Box 1 (Bahwere et al. 2011; GHS 2013; NDPC 2010). A manual, 'National Infant and Young Child Feeding Practices', was introduced as a guideline to ensure optimal child feeding practices. The Ghana Poverty Reduction Strategy (GPRS) II 2006-2009, had a Community-based Nutrition and Food Security Component on integrating primary healthcare and nutrition at the community level (GHS 2013). Other nutrition interventions implemented are the Ghana School Feeding Programme implemented by the Ghana Education Service and Regenerative Health and Nutrition Programme of the MOH (NDPC 2010; Ghartey 2010).

As a show of commitment, GoG substantially increased its funding for nutrition since 2007; 3.3% of total health service delivery budget and 4.6% of the total sum of government funds, cost recovery schemes and donor funds has been allocated for providing curative and preventive nutrition interventions for children and women. Nutrition care is now the fourth highest funded disease condition by the government similar to that of HIV, at 4.5% (Bahwere et al 2011).

Box 1: Components of Ghana's nutrition response

Ghana's health sector responses in tackling undernutrition have focused on curative, feeding practices (exclusive and extended duration of breastfeeding and age appropriate complementary feeding), deworming, school feeding programmes, micronutrient supplementations, sanitation and hygiene and nutrition education programmes. The strategy has been to use the CHPS system and volunteers to deliver nutrition and related health interventions at the community level (Bahwere et al. 2011, Ghartey 2010). Community Health Nurses work with and through trained volunteers. They take measurements of Mid Upper Arm Circumfrence (MUAC) and oedema and refer accordingly (Ghartey 2010). The off-shoot of this approach led to the formation of mother support groups where peers share ideas and experiences on nutrition and related topics (Bahwere et al. 2011).

Other public health strategies and approaches (Integrated Management of Neonatal and Childhood Illnesses (IMNCI), High Impact Rapid Delivery (HIRD) and National Immunization Days (NIDs)) are used by the GHS and MOH to deliver nutrition services to communities (Bahwere et al. 2011; GHS 2013), with emphasis on growth promotion, monitoring and counseling of mothers on feeding and hygienic practices (Ghartey 201; GHS 2013). Most health facilities now offer inpatient services for malnourished clients especially for Severe Acute Management (SAM); nutrition services have been integrated in routine service delivery. CMAM was introduced to replace facility based SAM of undernutrition (Bahwere et al. 2011; GHS 2013). A joint project on Nutrition and Malaria was implemented to reduce the synergistic effects of both conditions on child mortality in the country (Bahwere et al. 2011, Ghartey 2010 and GHS 2013).

Feeding centers have also been established by the GHS and MOH to provide nutritious food for children below two years using local staples and ingredients (Bahwere et al. 2011). They have also partnered UNICEF to run therapeutic food programmes (Plumpy'Nut) in designated health facilities throughout the country. Piloted projects on food rationing are also run by NGOs (Ghartey 2010).

Based on: Bahwere et al. 2011, Ghartey 2010 and GHS 2013

Global efforts at reducing undernutrition have always been inhibited by policy and programmatic failures, incoordination and duplication of interventions, fewer investment of resources (financial and human), competing priorities for governments attention, weak commitment towards implementation (Bryce et al. 2008; Morris, Cogill & Uauy 2008; UNICEF,

2013; UNSCN 6th Report), neglect of maternal nutrition and the high burden of HIV especially in sub-Saharan Africa (SSA) (UNICEF, 2009; UNSCN 6th Report). The above gaps (excluding that of HIV) mentioned and those contained in Box 2 are some of the documented challenges in Ghana's response to undernutrition.

Box 2: Gaps in Ghana's response

The inability of Ghana so far to have an operational national policy on nutrition has been the weakness of the country's response. This may have led to selective implementation of interventions that may not reflect the true burden, and could have resulted in unsustainability of interventions. The priority given to curative and rehabilitative nutrition services may have resulted in missed opportunities of implementation of preventive interventions which could have prevented the damaging effects of undernutrition suffered by Ghanaian children and women. The role of the academia, research and health training institutions has been limited in Ghana's response (Ghartey 2010).

There has been an over emphasis on how much food is being produced with less consideration for whether what is being produced is of the right mix and quality to solve current and also prevent future nutrition problems. The government has concentrated more on ensuring the country is food secure to the neglect of nutrition (Ghartey 2010).

A significant proportion of Ghanaians do not have access to nutrition and in general health services; and targeting has often been weak. The focus has mainly been on short term interventions on a small scale in large groups thereby minimizing the overall impacts of interventions, meanwhile the groups in need most continue to suffer from nutrition and health problems. Ghana's responses also lack comprehensiveness. Most interventions are singularly implemented, when joint implementation with other complementary nutrition and health interventions would have been cost effective and yielded greater impacts and benefits (GHS 2013).

Interventions on nutrition in Ghana are mostly generic and implemented without consideration to the differences in determinants across the country. A case in point is the continuous priority given to food insecurity as the main determining factor of undernutrition in the country when sufficient evidence has been adduced to suggest otherwise (GHS 2013)

Based on: Ghartey 2010, GHS 2011

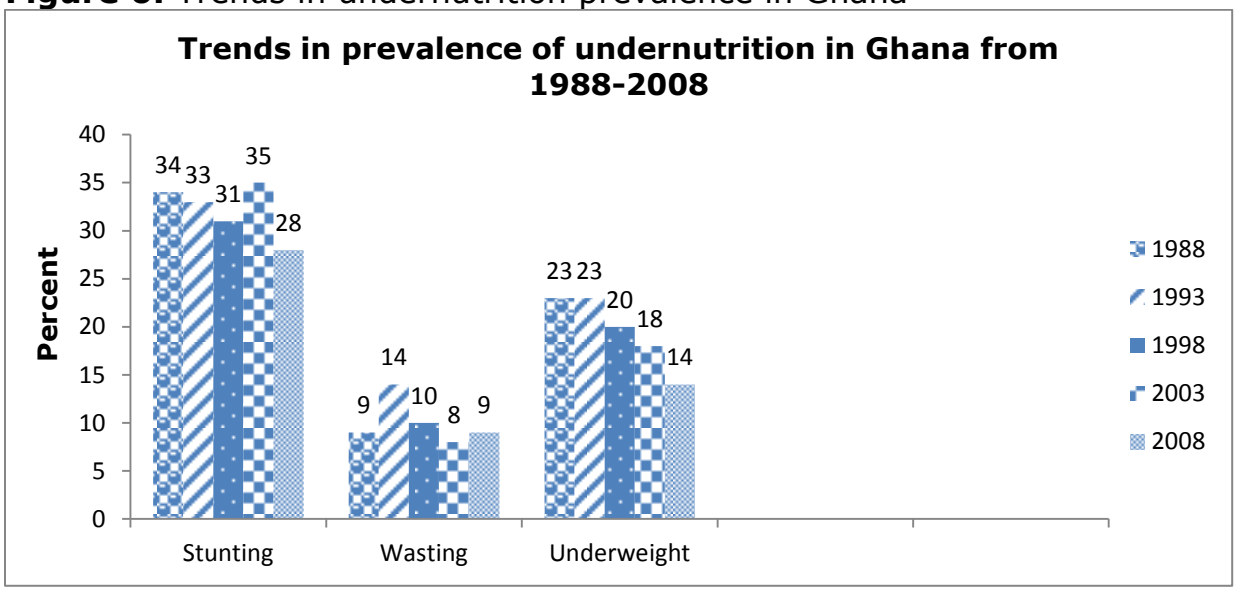
3.5 Trends in undernutrition prevalence in Ghana

Ghana halved poverty from 51.7% to 28.5% between 1991 and 2006. Prevalence of underweight was 31% in 1988; this has been reduced to 13.9% in 2008. In effect, Ghana has achieved MDG 1 before 2015 (NDPC 2010). This achievement is however marred by the high prevalence of PEM in children and women and poses a threat to public health (GSS, GHS & ICF MACRO 2009; GHS 2013; FAO 2009; NDPC 2010).

The national averages of undernutrition disguise wide disparities between the regions and among the different socio-economic strata. Stunting is more prevalent in boys, 30%, than girls, 26%, and between rural, 32%, and urban areas, 21%. Stunting is higher in younger children within the age range of two years, 40%, than in infants, 4%; this implies a high rate of growth faltering among Ghanaian children within the window of opportunity. Prevalence of stunting is higher, 25.3%, in children with uneducated mothers than children whose mothers have secondary or higher education, 13.2%. Likewise, children with mothers in the lowest wealth quintile are more stunted, 29%, than those in the highest wealth quintile, 12.5% (GSS, GHS & ICF MACRO 2009).

Trends in prevalence of wasting reversed significantly between 2003 and 2008 as shown in Figure 6. Older children between 48-59 months are less likely to be wasted, 3%, than children between 6-8 months, 29%. Wasting in some underdeveloped regions is 14%, this is exceptionally high. Prevalence of wasting is higher, 11.9%, in children with uneducated mothers than children whose mothers have secondary or higher education, 3.0%. Children of women in the lowest wealth quintile are more wasted, 9.7%, than those in the highest wealth quintile, 6.5%. Prevalence of underweight follow similar trends; 21.0% in children with uneducated mothers and 7.3% in children with mothers attaining secondary or higher education; 23.7% in children with mothers in the lowest wealth quintile and 12.2% in children whose mothers are in the highest wealth quintile (GSS, GHS & ICF MACRO 2009).

Figure 6: Trends in undernutrition prevalence in Ghana



(GSS, GHS & ICF MACRO 2009)

3.6 Determinants of undernutrition globally and in Ghana

In this section we discuss the broad determinants of undernutrition with short commentaries on the state of some of the determinants in Ghana.

3.6.1 The immediate causes

Infection and malnutrition in children may lead to a high catabolic state resulting in a breakdown of body energy stores. At the same time the child being *un-well* results in poor food intake due to poor appetite, the situation is aggravated in the event of illnesses like *diarrhoea* and *measles* resulting in increased nutrient losses (Black et al. 2013, 2008; UNICEF 2013).

When children are denied the benefits of either *exclusive or extended duration of breastfeeding,* it reduces their immunity to fight infections and may also lead to adverse health outcomes later on in their lives. When the *quality* and *quantity* of breast milk is compromised, it increases the risk of *suboptimum* breastfeeding and may consequently lead to undernutrition (Black et al. 2008). For instance in Somalia, mothers protect their own health by giving their children camel milk, tea and water as substitute for breast milk (Save the Children 2012a). Children below two years need to be *fed often* because their nutrient requirements, relative to their weight, is about four times that of an average adult, lest, they risk being unnourished and consequently undernutrition (Black et al. 2008; Save the Children 2009; UNICEF 2013; UNSCN 6th Report). The *timing* of introduction of complementary foods is also vital; too early or late may adversely affect a

child nutritionally (UNICEF 2009, 2013; UNSCN 6th Report). Feeding a child with *innutritious foods* even if optimally and frequently still exposes him/her to undernutrition (Black et al. 2008). In most developing countries quality processed complementary foods are usually inaccessible to most deprived families (UNICEF 2009, 2013).

The *weight* and *size* of a neonate at birth is in part dependent on the size and health of her mother. *LBW* babies are at greater risk of experiencing restricted growth in their early years for LBW in itself is already a symptom of chronic undernutrition (Black et al. 2008; UNICEF 2013, UNSCN 6th Report; Victora et al. 2008). Maternal overweight and obesity can restrict the growth of a foetus and this likely will result in stunting (Black et al 2013; Victora et al. 2008).

- It has been found that underweight children in some parts of northern Ghana are 1.67 times more likely of developing clinical malaria than non-malnourished children (GHS 2013). In Ghana, exclusive breastfeeding for children under two months is 84% reducing to 49% by the fifth month. 17% of infants below six months are given water and a further 17% fed with mushed foods respectively together with breast milk (GSS, GHS & ICF MACRO 2009).

3.6.2 The underlying causes

Poor households are faced with a dilemma of spending on food and forgoing other important needs. This may lead to *household food insecurity* even though they may still be spending a higher proportion of their income on food (Save the Children 2009; UNSCN 6th Report). For instance rural families and the poor in Ethiopia and Kenya spend a disproportionate amount, 59% and 67% respectively, of their income on food compared to just 9% for poor families in the United Kingdom (Save the Children 2009). Scarcity either due to seasonality or low production will drive food prices upwards. Poor households adapt by cutting expenditure on vital non-staples and animal based foods (Save the Children, 2009; UNSCN 6th Report).

Feeding practices undermine nutritional status. *Poor feeding* practices may be attributable to commitments of work and lack of knowledge on appropriate quality foods and feeding practices (Save the Children 2012a). Labour regulations and workplace environments are often not favourable for breastfeeding. Mothers are compelled to switch to breast milk substitutes; the longer time spent at work may also imply less attention and care for children (Bhutta et al. 2013; Gillespie 2013). In most developing countries the diet of children, like that of adults, is monotonous and hardly *varies*. It may also be that women may just not know the *right mix* of food suitable for

children. Children above six months are fed staples and infants are fed locally blended foods made mostly from grains (Save the Children 2012a; UNICEF 2013, UNSCN 6th Report).

The motherly experience can be an important factor in feeding and caring practices (UNSCN 6th Report; Save the Children 2012a). A woman with *many* children is presumed to be experienced in good feeding and sanitary practices and vice versa. Having more children Under 5 years may however be disadvantageous due to divided attention and in poor families insufficient food resources for all the children (UNSCN 6th Report; Frimpong and Pongou no date a). *Short intervals* between births can also adversely affect the nutritional status of both mothers and children (Bhutta et al. 2013; Frimpong and Pongou no date b).

- Despite national food sufficiency, 5% of Ghanaians are thought to be food insecure and a further 9% are at risk of being food insecure. It is estimated that for 3-4 months annually, poor families in Ghana are food insecure and up to 6-8 months in an unstable farming year (NDPC 2010). Of the 75% of Ghanaian households affected by rising domestic inflation, 83% cite increased expenditure on food as having the most effects (NDPC 2010).

3.6.3 The basic causes

In most developing countries amenities for water and sanitation are not nutrition sensitive (Gillespie 2013); there is a wide gap between need and supply. Even what is available are usually either not distributed fairly or are poorly designed thereby limiting their benefits and impacts (UNICEF 2013). Family hygiene and sanitation is affected when there is inadequate supply of water to households and which may lead to infections. For instance safe drinking water is inaccessible to over half of the populations in SSA, people resort to the use of untreated and contaminated water sources. Also, sanitation and drainage facilities in these countries are not covered and constructed in the middle of clustered settlements often resulting in the outbreaks of diseases (Save the Children 2012a, 2012b, 2009; UNICEF 2009).

Because nutrition is less prioritized in developing countries, interventions are inadequately funded. Nutrition interventions are often integrated into other health and agriculture sector interventions and the focus on nutrition is usually lost during implementation (Gillespie et al. 2013). Health services in developing countries are saddled with problems of access and unavailability (Save the Children 2012a). Health workers may not be adequately trained on nutrition. In the curriculum of most health training institutions in these

countries, nutrition is taught as a subject and not a course. This may affect the delivery and quality of clinical and preventive nutrition services (Bryce et al. 2008; Ruel & Alderman et al. 2013). Essential nutrition drugs and therapeutic foods may also not be available to the critically ill (Save the Children 2012a).

Economic growth is expected to in the long run lead to good nutrition, however, if unchecked may deepen existing inequities of wealth and income thereby exacerbating undernutrition (Save the Children 2012a, 2012b; UNICEF 2009). Most developing countries in their quest to reach middle and high income status prioritize the service and manufacturing sectors and less emphasis is given to social interventions especially for women and children. This may result in low food production, deepen poverty and adversely affect nutrition. As witnessed in the developed world in 2007, such strategies in the long run may lead to economic crisis which result in rising food prices (Ruel & Alderman et al. 2013; Save the Children 2009; UNSCN 6th Report).

Seasonal variations, droughts or floods leave women and children prone to infections. Such events are accompanied by parasite, and insect infestations and water and sanitation problems. During such periods access to food is difficult for the vulnerable and families may resort to coping strategies (Save the Children 2012b, 2009; UNSCN 6th Report, 2010). In Peru, incidence of diarrhoea is reported to increase by about 8% in children and adults during extreme increases in temperatures (UNSCN 6th Report).

Conflicts, because of their usually long duration, are disruptive to health services, food security and availability. This compromises health and negatively affects feeding in terms of food quality, diversity and frequency (Save the Children 2009; UNSCN 6th Report). Rates for all the different forms of undernutrition worsened during the fighting in Côte d'Ivoire as the healthcare delivery system virtually collapsed (Save the Children 2012b).

Social norms (such as early marriage, discouraging pregnant women from eating certain foods and reserving a large and best part of the meal for men) may undermine the status of women and children (Save the Children 2012a, 2012b; UNICEF 2009; UNSCN 6th Report). Evidence abounds in developing countries of the low value society places on women; they are often stifled in terms of household decision making and access to resources. This has been documented to result in household food insecurity (AHDR 2012; UNICEF 2009). In Malawi, family arrangements are hostile towards women, women are not permitted to own or inherit the property of their husbands (WFP 2009).

Educational status of women may have direct impacts on health outcomes of mothers and children as a more enlightened mother stands a better chance of utilizing and understanding health messages and putting them to practice

(Ruel & Alderman et al. 2013; Sanawar et. al, 2005; Frimpong and Pongou no date a). Education of women may also lead to a suitable occupation which is likely to improve household food security. But also the type of occupation determines the time a woman spends in feeding and caring for her child. This therefore makes a woman's employment status an important predicator in health and nutrition outcomes (Frimpong and Pongou no date b).

Agriculture is directly linked to *food security*. The volume and *variety* of agricultural produce is a key determinant of nutrition. In developing country contexts where subsistence farming is the main agricultural activity, production is mainly staple crops; livestock usually involves rearing of a few animals which most often is not eaten but rather sold (Save the Children 2009; UNSCN 6th Report;). Larger production of staple or cash crops is not sufficient to improve nutrition and may even have a negative effect, hence the need for *nutrition sensitive* programming in both agriculture and *food security* (Ruel & Alderman et al. 2013).

- Challenges of frequent shortages, poor quality, contamination at the point of access and inadequate infrastructure for distribution and storage of water are common in Ghana and have been noted to cause public health problems. Only 8.2% of Ghanaians in 2008 had access to improved sanitation and access in the rural areas was 8.2% (GSS, GHS & ICF MACRO 2009; NDPC 2010).

- Ghana is yet to devise a strategy for the continuation of Vitamin A supplementation in the face of the eminent closure of the NIDs programme – Vitamin A supplementation in Ghana is administered during the NIDs for polio (GHS 2013). Only 27% of women in rural Ghana live within thirty minutes radius of a health facility (FAO 2009). This long distance from the health facilities exacerbated by a poor referral system has resulted in poor health seeking behavior and adverse health outcomes for both children and mothers (GHI 2012).

- Reductions in poverty in Ghana has not been even, up to 70% of the population in some regions live below the poverty line (NDPC 2010); 39.2% of rural folks are poor against 10% of urban dwellers (GHI 2012). Further, the difference in poverty levels and access to food between food crop farmers and other occupations, men and women is striking; it should also be noted that food crop farmers (constitute 60% of the poor) are mostly women in Ghana (FAO 2009; NDPC 2010).

- A significant proportion of Ghanaians are food insecure during the period leading to harvest of crops. Most parts of northern Ghana perennially experiences food shortages which has variously been attributed to insufficient rains and harsh environmental conditions (FAO 2009; NDPC 2010; Van de Poel 2007).

Chapter 4

4.1 Selection of variables

Table 4 illustrates the variables we used in our analysis. Variables were selected based on the literature review conducted.

Table 4: Variables of analysis

Literature Review/Conceptual Framework	**Variables**
Immediate determinants	
Childs age	▪ 6-11, 12-23, 24-35 and 36 and above months
Infections	▪ Malaria, Diarrhoea and ARI
Feeding practices	▪ Breast feeding and Complementary feeding
Underlying	
Childs Sex	▪ Female and male
Mothers age	▪ Below 30 years and 30 and above years
Mothers nutritional status	▪ Normal (BMI 18.50-24.99) ▪ Underweight (BMI<18.5) ▪ Overweight (BMI >25) ▪ Obese (BMI>30)
Basic	
Mothers occupation	▪ Trading ▪ Farming ▪ Public sector ▪ Unemployed
Mothers education	▪ Illiterate ▪ Primary school level ▪ Junior High School (JHS) and Senior High School (SHS)
Mothers marital status	▪ Married and Unmarried

4.2 Socio-economic characteristics of respondents

Characteristics of 310 children between 6-59 months and their mothers were analyzed. As shown in Table 3, most of the children, 63%, were between the ages of 12-35 months. There is an even representation of male and female children. Mothers were categorized as below 30 years (64%) and above 30 years (36%). Majority of the mothers, 43%, are into trading. 82% of the mothers had some level of education and 18% had no education. 76% are married or in unions.

Table 5: Characteristics of children and mothers in KSD with added columns on the regional and national prevalence of stunting and wasting

Variables	**N**	**%**	**Eastern Region**	**GDHS 2008**
Child's nutritional status				
Stunting(Height for age)				
Absent(+2Z scores)	268	86		
Present (-2Z scores)	42	14	37.9	28
Wasting(Weight for height)				
Absent(+2Z scores)	251	80		
Present (-2Z scores)	59	20	6.4	8.5
Immediate				
Child's age(in months)				
6-11	44	14		
12-23	96	31		
24-35	98	32		
36+	72	23		
Infections				
Malaria				
Yes	252	81		
No	58	19		
Diarrhoea				
Yes	259	81		
No	58	19		
Acute Respiratory Infection (ARI)				
Yes	259	81		
No	58	19		
Feeding practices				
Breastfeeding				
Yes	112	36.12		
No	198	63.87		
Complementary				
Yes	275	88.71		
No	34	10.96		
Underlying				
Sex of child				
Female	155	50		
Male	155	50		
Age of mothers				
<=30	199	64		
>=30	111	36		
Mother's nutritional Status				
Normal (BMI 18.50-24.99)	188	61	59.1	61
Underweight(<18.5)	26	8	4.7	8.6
Overweight(BMI >=25)	64	21	33.8	29.9
Obese (>=30)	32	10	9.8	9.3
Stunting	-	-	2.1	1.4
Basic				
Occupation				

Trading	132	43		
Farming	94	30		
Public Sector	6	2		
Unemployed	52	17		
Education				
None	54	18		
Primary	78	25		
Beyond primary(JHS/SHS)	176	57		
Marital Status				
Married	236	76		
Non Married(Divorced, Widowed, Single)	74	24		

4.3 Findings

We further analyzed the data from the nutrition survey carried out in 2011 by KSD. Findings from this survey are summarized in Tables 5 and 6. Fourteen percent of the children were stunted and 20% wasted. Further, 18%, 21% and 10% of mothers were underweight, overweight and obese respectively.

4.3.1 Statistical analysis

Results of univariate analysis as summarized in Table 6. As the table shows children between 12-23 and 24-35 months old were respectively about 2 and 9 times more likely to be stunted than 6-11 month olds. The difference between these children and children aged 24-35 months was significant (***p<0.04***). Male children were less likely to be stunted than female children but the difference was not significant. Mothers' occupation (trader, farmer and unemployed) was not found to have a significant influence on stunting. Children of mothers educated to the primary level (OR=2.5, 95% CI 0.58-11.2) and beyond the primary level were about 3 and 4 times (***p<0.03***) more likely to be stunted than children whose mothers were uneducated.

Children who were not breastfeeding were 0.4 less likely to be stunted than children who were still breastfeeding but the difference was not significant (p>0.11). Children without malaria and diarrhea respectively were 0.7 and 0.9 less likely to be stunted than children suffering from these conditions, the difference was however small. Children of underweight and obese mothers were about 1.5 or equal likely to be stunted than children whose mothers had normal BMI, the difference was small. Those whose mothers were overweight were less likely to be stunted.

Children between 12-23 and 24-35 months old were about 2 and 3 *(**p>0.07**)* times more likely to be wasted than 6-11 month olds. Male children were 3 *(**p<0.02***) times more likely to be wasted than females. Children with mothers above 30 years were 2 times more likely to be wasted

than children with mothers below 30 years, the significance was however weak. Also, children of farmers were 2 times at risk to be wasted than children of traders, albeit with weak power. Children whose mothers were unemployed were less likely to be wasted. Mothers' education (primary and above the primary level) was not found to have a significant influence on wasting. Breastfeeding had a significant influence on wasting of children, those who were not breastfeeding were less at risk *(**p<0.02**)*. Malaria, diarrhoea and ARI were not found to have a significant influence on wasting. Children whose mothers were underweight were about 2 times more at risk to be wasted than children whose mothers had normal weight, but with weak power.

Table 6: Associations (Univariate) between stunting and wasting in children and predictors

Variables	Stunting		Wasting	
	OR 95% CI	**P value**	**OR 95% CI**	**P value**
Immediate				
Child's age(months)				
6-11				
12-23	1.9(0.55-6.67)	0.30	2.4(0.78-7.3)	0.12
24-35	9.0(1.02-80.7)	**0.04**	2.9(0.91-9.2)	0.07
36+	-	-	-	-
Infections				
Malaria				
Yes				
No	0.7(0.18-2.59)	0.57	1.3(0.37-4.68)	0.66
Diarrhoea				
Yes				
No	0.9(0.21-4.63)	0.98	1.1(0.31-3.98)	0.85
Acute Respiratory Infection				
Yes				
No	2.2(0.27-17.5)	0.45	1.1(0.31-3.98)	0.85
Feeding practices				
Breastfeeding				
Yes				
No	0.4(0.12-1.25)	0.11	0.4(0.13-0.88)	**0.02**
Complementary feeding				
Yes				
No	0.7(0.09-5.81)	0.76	0.4(0.05-3.15)	0.39
Underlying				
Sex of Child				
Female				
Male	0.7(0.20-2.30)	0.56	3.2(1.13-9.0)	**0.02**
Age of mother				
<=30				
>=30	1.1(0.32-3.80)	0.85	1.7(0.61-4.88)	0.30
Mothers Nutritional status				
Normal				
Underweight	1.5(0.16-13)	0.73	2.2(0.27-17.1)	0.46
Overweight	0.6(0.52-4.2)	0.50	1.3(0.42-4.07)	0.65
Obese	1.2(0.07-20.8)	0.88	-	-
Basic				
Occupation				
Trading				
Farming	1.1(0.29-3.91)	0.91	1.8(0.56-6.06)	0.31
Public sector	-	-	-	-
Unemployed	1.2(0.23-6.09)	0.83	0.8(0.25-2.37)	0.65
Education				
None				
Primary	2.5(0.58-11.2)	0.21	1.2(0.29-4.56)	0.82
Beyond primary	4.4(1.14-17.2)	**0.03**	1.2(0.37-3.98)	0.75
Marital status				
Married				
Non married	0.9(0.25-3.56)	0.92	0.6(0.21-1.4)	0.23

4.3.2 Multivariate

Following the univariate analysis, all variables together with family size, birth order, insurance status and access to health services were treated as confounders and put in a multivariate logistic elimination model. The variable showing least significance was eliminated. This process was repeated until the final model was obtained and is presented in Table 7.

Children between 12-23 and 36 months old and above were respectively about 6 and 11 *(**p<0.005**)* more at risk to be stunted than children 6-11 months. Male children were less likely to be stunted but the difference was not significant. The risk of stunting in children whose mothers were unemployed although 3 times higher than in children whose mothers were traders (OR=3.38, 95% CI 0.31-36.07) was not significant. Children whose mothers were educated above the primary level were 0.19 times less likely to be stunted than children whose mothers were uneducated (OR=0.19, 95% CI 0.004-8.54).

Additionally, children of unmarried women were 0.52 times less at risk to be stunted than children of married women (OR=0.52, 95% CI 0.08-3.26). After adjusting, children who were not breastfeeding were about 5 times more likely to be stunted than children who were still breastfeeding (OR=4.7, 95 CI 0.62-35.55). Children without malaria were 0.5 times less at risk to be stunted than children with malaria, but this was not significant. However, children without diarrhea were just as likely to be stunted as children with diarrhea (OR=1.11, 95% CI 0.10-11.35). Further, children without ARI were about 4 times higher at risk to be stunted than children without ARI (OR=3.56, 95% CI 0.17-72.70). A mother being overweight was a protective factor against her child being stunted (OR=0.15, 95% CI [0.02-0.82], ***p<0.02***), and this was statistically significant after controlling for other covariates. Children whose mothers were obese were 0.2 times less likely to be stunted than children whose mothers had normal weight (OR=0.26, 0.02-3.61), but the difference was not significant.

The risk of wasting in children 12-23 and 24-35 months olds was about 2 times higher than children between 6-11 months (OR=2.4, 95% CI 0.63-9.19) (OR=2.14, 95% CI 0.26-3.36), but with weak significance. After controlling for other factors, male children were about 3 times likely to be wasted than female children (OR=3.20, 95% CI [1.02-10.06], ***p<0.04***), and statistically significant. Further, the risk of wasting was about 2 times higher

in children whose mothers were farmers than children of women who were traders (OR=2.20, 95% CI 0.58-8.32), but with weak power. Children whose mothers were educated to the primary school level (OR=0.94, 95% CI 0.26-3.36) and beyond (OR=0.73, 95% CI 0.15-3.47) were less likely to be wasted than children whose mothers were uneducated, though not significant. Children of unmarried women were 0.48 times less at risk to be wasted than children of married women (OR=0.48, 95% CI 0.14-1.58), the difference was not significant.

Additionally, non-breastfed children were about 0.6 times less likely to be wasted than children who were still breastfed (OR=0.60, 95% CI 0.10-3.34), the difference was not significant. After adjusting, children with malaria were about 2 times more at risk to be wasted than children without malaria (OR=1.72, 95% CI 0.36-8.14). Those without diarrhea (OR=1.33, 95% CI [0.28-6.20], p>0.70) and ARI (OR=1.09, 95% CI [0.26-4.49], p>0.90) were just as likely to be wasted as children with those conditions. Furthermore, children whose mothers were underweight were about 3 times more likely to be wasted than children whose mothers had normal weight (OR=2.67, 95% CI 0.29-24.3), but with weak significance. Also children of overweight mothers were just as likely to be wasted as children of women with normal weight.

Table 7: Association (multivariate) between stunting and wasting in children and predictors

Variable	Stunting		Wasting	
	OR 95% CI	**P value**	**OR 95% CI**	**P value**
Immediate				
Child's age(months)				
6-11				
12-23	5.66(0.74-42.77)	0.09	2.4(0.63-9.19)	0.19
24-35			2.14(0.26-3.36)	0.47
36+	111(4.13-29.91)	**0.005**		
Infections				
Malaria				
Yes				
No	0.54(0.07-4.25)	0.56	1.72(0.36-8.14)	0.49
Diarrhoea				
Yes				
No	11.1(0.10-11.35)	0.92	1.33(0.28-6.20)	0.70
Acute Respiratory Infection				
Yes				
No	3.56(0.17-72.70)	0.40	1.09(0.26-4.49)	0.90
Feeding practices				
Breastfeeding				
Yes				
No	4.7(0.62-35.55)	0.13	0.60(0.10-3.34)	0.56
Complementary feeding				
Yes				
No	0.18(0.01-2.40)	0.19	0.32(0.03-2.89)	0.31
Underlying				
Sex of child				
Female				
Male	0.60(0.14-2.48)	0.48	3.20(1.02-10.06)	**0.04**
Age of mother				
<=30				
>=30	1.47(0.2-7.48)	0.63	1.07(0.31-3.69)	0.90
Mothers Nutritional status				
Normal				
Underweight	1.10(0.07-16.41)	0.13	2.67(0.29-24.3)	0.38
Overweight	0.15(0.02-0.82)	**0.02**	1.10(0.31-3.83)	0.87
Obese	0.26(0.02-3.61)	0.32		
Basic				
Occupation				
Trading				
Farming	1.18(0.23-5.92)	0.83	2.20(0.58-8.32)	0.24
Public sector	-	-		
Unemployed	3.38(0.31-36.07)	0.31	1.26(0.29-5.39)	0.75
Education				
None				
Primary	1.74(0.26-11.65)	0.56	0.94(0.26-3.36)	0.93
Beyond primary	0.19(0.004-8.54)	0.39	0.73(0.15-3.47)	0.70

Marital status				
Married				
Non married	0.52(0.08-3.26)	0.49	0.48(0.14-1.58)	0.22

Chapter 5

5.1 Discussion

We discuss the results of our analysis. Unless otherwise stated, the discussion is related to our findings after adjusting for other covariates.

5.2 Limitations

We acknowledge that this analysis is not without some limitations. We note that the sample size is relatively small and likely to have affected some of the outcomes of our analysis. A larger sample size may have yielded different results. We also note that the data collected by KSD that we used in our analysis has been a big limitation; notably mission was information on infant and young child feeding practices, information on the wealth status of respondents and information on access to health services and other determinants of undernutrition. We state that our findings are limited to the study area and may not even be extended to the region. We caution that our findings should not be interpreted to mean causality and that where we did not find associations do not mean they do not exist.

5.3 Prevalence of stunting and wasting

Ghana's nutrition indicators are better than most of her peers in SSA (Van de Poel et al. 2007). However, the persistence of PEM among children and women is clearly an indictment on the achievement of MDG 1 (GHS 2013). In this study we report of determinants and their associations to stunting and wasting in children 6-59 months in a largely rural district in Ghana. Our findings on prevalence of stunting and wasting differ substantially from that of the Ghana Demographic Health Survey (GDHS) 2008 as shown in Table 5 for both the national and regional averages. Our findings also differ from that of the Multiple Indicator Cluster Survey (MICS) of 2011 which reported 22.7% and 6.2% as national averages for stunting and wasting respectively; regional prevalence in the MICS were 21.3% and 6.8% for stunting and wasting. In our study, we used the 2007 WHO Child Growth Standards while the GDHS used the 2006 standards, the differences in classifications may have contributed to the differences in outcomes. Our findings however confirm the wide geographical disparities in prevalence of undernutrition in Ghana and that within a defined geographical location prevalence of stunting and wasting may still vary from one location to another. Anderson et al. and Van de Poel et al. made similar observations in their studies of determinants of malnutrition in Ghana.

We strongly believe that differences in sample composition and size (the difference in sample size is about nine fold and the GDHS included children below six months old) between our study and the GDHS are significant and possibly explain the differences in results; the GDHS is more representative. Therefore, we presume that extreme factors in certain parts of KSD would have influenced our results. We also deduce especially for wasting that the period and duration between our study and the national surveys could have influenced the outcome; our study was conducted within a space of 6 days in August, usually the peak of the lean season in most parts of Ghana, while the GDHS spanned from September to November – the first harvest season in southern Ghana usually starts from late September. Therefore the effects of food shortages would have been more profound in our study area, thereby explaining our finding on wasting. Our study confirms earlier reports by FOA and NDPC that a significant proportion of Ghanaians are food insecure and that during certain times of the year certain types of food are unavailable in certain geographical areas and that food prices rise substantially during the lean season (FOA 2009 and NDPC 2010).

We also posit that the setting of our study area could have affected the outcome of our analysis; our study area is rural with only a few semi-urban centers. As noted by Medhin et al., Sanawar et al. and Van de Poel et al., differences in geographical prevalence of stunting and wasting in a country may be the effects of variations in environmental and cultural factors (Medhin et al 201; Sanawar et al. 2005; Van de Poel et al. 2007). Thus, our results may just be a reflection of the peculiarity of KSD. This re-echoes the fact that the determinants of undernutrition are context specific and emphasis the need for evidence based decisions to tackling the plague of undernutrition. Unfortunately, most nutrition interventions in Ghana, and for that matter KSD, especially those from the public sector are planned at the national level and handed down to districts to implement often leading to the implementation of context inappropriate interventions.

Our finding on wasting is not surprising. Epidemiologically, the incidence of diarrhea in our study area increases exponentially in March (that is the onset of the rainy season) and during the peak of the wet season (which is between August and October for the forest belt). The high prevalence of diarrhea could have resulted in the high prevalence of wasting. Apart from three urban towns in our study area that had access to tap water, the rest of the communities got their drinking water from streams; which we strongly link to the high incidence of diarrhea. Along the tributaries of the Volta Lake, communities got their water from polluted sources due to fishing and livestock drank from the same source. Similarly, sanitation facilities can only be found in the urban towns. Majority of the population in this district practice open defecation which is washed by rain into the very streams they drink from. This finding re-emphasis the fact that undernutrition in KSD is

beyond the purview of any single department and that it requires a combined effort to provide services and amenities that will directly, or indirectly reduce or mitigate the risk factors of undernutrition.

As has been reported by the GDHS, Olanrewaju, Iyabo & Bamidele, Kabubo-Mariara et al., and Van de Poel et al. we also report that undernutrition manifests as children grow older. In our findings there was a linear correlation between age and stunting. The effects of suboptimum and infrequent feeding accumulate over time, hence, stunting is more visible in older children (Frimpong and Pongou no date b; Medhin et al. 2010; Olanrewaju, Iyabo & Bamidele 2011). In Ghana, including KSD, less attention is given to vaccination of older children; the health system's target for immunization is mostly infants and very young children. Immunizations programmes in KSD and the MOH and GHS need to realize this gap and address it.

5.4 Discussion on determinants of stunting and wasting

Earlier findings by Olanrewaju, Iyabo & Bamidele and Kabubo-Mariara et al confirm our finding on the association between higher mothers' educational level and less risk of stunting and wasting in children. We presume that educated mothers are likely to earn more income which will then translate into household food security thereby reducing the risks of wasting. A more enlightened mother stands a better chance of understanding nutrition and health messages and putting them to practice, helping improve their children's nutritional statuses (Ruel and Alderman et al. 2013). We agree with Frimpong and Ponguo that education in itself may not be a protective factor against undernutrition but the level of knowledge and information that comes with education (Frimpong and Ponguo no date a). This finding further manifestation of the generally inability of women in Ghana, especially in rural areas, to pursue higher education and this has serious implications for the perpetuation of the intergenerational transfer of undernutrition and poverty and further highlights the need for multisectoral approaches to tackling undernutrition.

We found that stunting was higher in children of unemployed women than children of women engaged other forms of occupation. It is similar to that reported by Van de Poel et al. in Ghana and Olanrewaju, Iyabo & Bamidele in Nigeria. We note that diet diversity is probably lower among unemployed women as a result of lower incomes, hence may result in stunting. This finding reiterates the importance of income generating interventions for women. Also, it confirms earlier evidence mentioned in this paper that women farmers are the poorest in Ghana. This calls for multisectoral gender and nutrition sensitive interventions especially in health and agricultural to

improve and guarantee the incomes of women which will in the long term enhance their health and nutrition and that of their children.

We report of high stunting and wasting in children of thin women (not significant), and a significant lower prevalence of stunting in children of overweight women. Similar findings were made in a state in Nigeria by Olanrewaju, Iyabo & Bamidele. Micronutrient deficiencies due to food insecurity or poverty and in combination with poor health could result in anemia and LBW kids. Literature is suggestive that stunting in children is positively correlated to obesity in their mothers; hence our finding is consistent (Bhutta et al. 2013; Black et al. 2013). Maternal thinness can be attributed to poverty leading to food insecurity, hence, wasting. The focus of Ghana's nutrition responses on curative services and less emphasis on preventive services could have accounted for this. Thus, preventive services should be given equal emphasis in nutrition programing by KSDHA, GHS and MOH. The outcome of our analysis on maternal nutritional status and presented in Table 5 confirms that of the GDHS and echo the need for strengthened and integrated nutrition and health interventions in order to break the intergenerational chain of undernutrition, other than that child stunting and wasting will remain pervasive in KSD and Ghana. The DHMT should expand their nutrition programming to include maternal nutrition.

Studies in Ghana (van de poel et al. and Frimpong & Pongou) and globally (Shahabuddin et al., Sebastion & Senti and Lwambo et al.) reported of higher stunting in boys than in girls. We found wasting to be higher in boys than in girls with a strong power. Reasons explaining such outcomes are usually attributed to biological differences between girls and boys (Frimpong and Pongou no date b; Medhin et al. 2010). Such differences could also possibly be due to and explained by contextual family and cultural factors (Srivastava et al. 2010; Olanrewaju, Iyabo & Bamidele 2011). We also assume that the high altitude and moderate temperatures in our study area could have had different effects on both boys and girls.

Our finding in table 7 of higher risk of stunting in children who suffered from malaria is not novel. Our finding confirms that reported by the GHS for certain parts of northern Ghana (GHS 2013). Ehrhard et al., Takakura et al., and Williams et al., also reported of an association between malaria and undernutrition. However, Holding & Kitsoa-Wekulo and Harrison & Waterlow reported of no mutual association between malaria and undernutrition; and Edirisinghe and Hendrickse et al. observed based on hospital based studies that malaria was protective against PEM and this was later confirmed by Genton et al. and Nyakeriga et al. We therefor note that the setup of our study does not allow for any conclusion. Given the high prevalence of disease in comparison to the relative small sample size it is very difficult to

find significant correlations, thus, our adverse finding between ARI and stunting and diarrhea and wasting.

We did not observe any significant associations between breastfeeding and stunting and wasting. We note that this probably was by chance and explained by our sample size and limitations in the data on breastfeeding. As we further disaggregated the data on breastfeeding; it showed that the rate of breastfeeding progressively declined, the differences between the age groups were substantial. We therefore deduce extended breastfeeding beyond one year is poorly practiced. We also presume diet diversity in our study area to be very much the same as that of communities in middle and forest areas of Ghana consisting of starchy roots. Older children above two years usually eat from the family pot while those that are mixed fed are given mushed or blended foods. However, in our study area for most parts of the year fruits and leafy vegetables are available to most families in the district; this may be interpreted to imply a reasonably good supply of certain essential nutrients thereby lessening the risk of especially stunting. We observe that farmers in this area cart a higher portion of their produce to the market making them less food secure. Anderson et al. made similar observations.

Our finding of less risk of stunting and wasting in children of unmarried women could possibly be suggestive that a woman being in any kind of union is indicative of many other people (children and partners) in the family. A family of many people especially in poor households may lead to suboptimum feeding. Srivastava et al made similar observations in India that children in extended families are vulnerable to chronic undernutrition. Nutrition programmers should be aware of the family as a determinant of undernutrition and act accordingly. Our study also reports of higher undernutrition in children of older mothers than children of younger mothers; this is similar to that found by Medhin et al. in a cohort study on children aged 6 and 9 months in Ethiopia. We presume that the older a mother (compared to a young mother), the more likely her child will be older and undernutrition is more prevalent in older children (Medhin et al. 2010).

5.5 Looking forward

The nutrition landscape was revolutionized in 2008 with the publication of The Lancet Series on child and maternal undernutrition which provided evidence that triggered an unprecedented response within the nutrition community; the 2013 series has further added to this evidence (Bhutta et al. 2013; Gillespie 2013). Here, we discuss some contemporary nutrition interventions that are particularly promising for programming in Ghana and our study area.

The clarion call in the nutrition landscape today is for the scale-up of child and maternal nutrition interventions. Adequate targeting during the first 1000 days of life, of young and teenage girls, women within the reproductive age and pregnant and lactating women with multiple micronutrient supplementations at scale is predicted to significantly reduce and break the chain of the intergenerational cycle undernutrition (Bhutta et al. 2013; Black et al. 2013; Taylor, Dangour & Srinath 2013). The decreasing trend of undernutrition in Ghana is an indication that a massive scale-up of the already ongoing interventions can reduce further the undernutrition burden of the country. KSDHA, MOH and GHS can also use such programmes to address the increasing prevalence of overnutrition among Ghanaian women.

Health system and community delivery channels have been identified to provide the best avenues to deliver nutrition services to the intended beneficiaries. Such platforms as school health, and feeding programmes, integration of nutrition services in routine health care and outreach programmes, community sensitization on behavior change in relation to diet change and sanitation and mother support groups. That health systems and nutrition programmes stand to benefit mutually if they work in harmony Bryce et al. 2013; Gillespie et al. 2013; Ruel et al. 2013) . Ghana has to strategize and prioritize prevention programmes on nutrition; the CHPS system provides an excellent platform. KSD should seek to expand the CHPS network in the district to provide comprehensive services including nutrition related services. The country also needs to invest more in school health and feeding programmes to scale-up and strengthen targeting.

The 2013 series of The Lancet strongly advocates for the creation of supportive environments that address existing nutrition needs - nutrition specific interventions - and also the pursuance of interventions that indirectly mitigate the effects of distal determinants on child and maternal nutrition - nutrition sensitive interventions. Equal investments in other nutrition sensitive interventions are necessary to mitigate the basic causes of undernutrition in the country. This calls for collaboration, dialogue and partnerships at all levels – district, regional and national.

That governance of the nutrition arena should be improved globally, among development agencies and nationally. The role of the private sector and civil society in nutrition programming and financing is increasingly recognized and advocated for in multisectoral responses. That strengthening institutions will improve monitoring and evaluation of nutrition whiles also enhancing accountability. Timely and accurate data on nutrition is advocated for to ensure evidenced based decision making and improve overall planning and implementation of nutrition programmes (Bryce et al. 2013; Gillespie et al. 2013; Ruel et al. 2013). Its time Ghana harmonized and created an institutional home for nutrition. Champions are need for intense lobbying in

order that government demonstrates more commitment financially and towards implementation of its nutrition policies. Ghana also needs to redesign and adapt its information management systems to adequately capture nutrition data.

5.6 Conclusion

The wasting prevalence of 20% in KSD not highlights a wide disparity in food insecurity within the district but also in lack of basic amenities of safe drinking water and sanitation. Higher prevalence of stunting in older children is a manifestation of growth faltering in early life and of deprivations in essential nutrients over a long period, and the failure on the part of the health system to pick up such cases on time. Undernutrition in KSD, like most parts of Ghana, is caused by a multitude of factors, all contributing significantly to a high burden of disease. Child undernutrion is linked to maternal undernutrition in KSD; the double burden of maternal malnutrition will result in a higher prevalence of stunting with adverse future health and economic consequences.

The nutrition programmes of KSDHA should be designed to include both curative and preventive services. Coverage of current nutrition interventions should be expanded and widened to ensure that comprehensive nutrition services are available to children and women. Targeting of nutrition interventions should prioritize deprived communities and most-in-need or at-risk groups. Monitoring should be strengthened with an agenda for routine evaluation of nutrition programmes.

The lack of essential amenities, services and infrastructure that promote good nutrition portrays a daunting challenge to nutrition programming in KSD. KSD has success stories to learn from both within and outside of Ghana. A sound health system and infrastructural base is already in place. KSDHA is primed lead and play the lead role in driving the nutrition agenda in the district.

5.7 Recommendations

Based on our findings, we recommend the following to KSDHA.

1. KSDHA should expand CMAM to all CHPS compounds, recruit and train more community volunteers on CMAM.
2. The DHMT should develop Information Education and Communication (IEC) programme on sanitation and hygiene and integrate it into routine outreach programmes.
3. The DHMT should develop and implement sensitization and education sessions for mothers on infant and young child feeding practices during child welfare clinics/days and growth monitoring sessions.

4. KSDHA should strengthen maternal nutrition interventions and offer nutrition counseling sessions for pregnant women.
5. KSDHA should actively engage the agriculture, education, water and sanitation department and the district assembly to harmonize their responses on nutrition and on how best their activities can be integrated.
6. Capacity of health care professionals on communication should be built to enhance effective dissemination of nutrition and related health information to the populace.
7. KSDHA should improve the design and widen the scope of its nutrition surveys to include Infant and Young Child Feeding Practices, economic and other determinants of undernutrition.
8. The DHMT should develop an agenda for research and improve the collection of nutrition data.

References

African Development Bank 2012, *Republic of Ghana Country Strategy Paper 2012-2016,* Country Operations Department – West 1 Region.

Africa Health Workforce Observatory 2010, *Human Resources for Health Country Profile Ghana*, WHO, AHWO, 2010.

Anderson, AK, Bignell, W, Winful, S, Soyiri, I & Steiner-Asiedu, M 2010, 'Risk Factors for Malnutrition among Children 5-years and Younger in the Akuapim-North District in the Eastern Region of Ghana, *Curr. Res. J. Biol. Sci.*, 2(3): 183-188.

Bahwere, P, Samuel, AA, Michael, N, & Isabella, SM 2011, *Report on the Review of the Integration of Community-Based Management of Severe Acute Malnutrition into the Ghana Health Services*, Washington DC, FANTA-2 Bridge/FHI 360.

Benson, T 2005, *An assessment of the causes of malnutrition in Ethiopia, A contribution to the formulation of a National Nutrition Strategy for Ethiopia,* International Food Policy Research Institute, Washington DC, USA.

Bhutta, ZA, Ahmed, T, Black, RE, Cousens, S, Dewey, K, Giugliani, E, Haider, BA & Kirkwood, B 2008, 'What works? Interventions for maternal and child undernutrition and survival', *The Lancet Series,* DOI:10.1016/S0140-6736(07)61693-6.

Bhutta, ZA, Das, JK, Rizvi, A, Gaffey, MF, Walker, N, Horton, S, Webb, P, Lartey, A Black, RE, The Lancet Nutrition Interventions Review Group, & the Maternal and Child Nutrition Study Group 2013, 'Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?', *The Lancet Series,* dx.doi.org/10.1016/S0140-6736(13)60996-4.

Black, RE, Victora, CG, Walker, SP, Bhutta, ZA, Christian, P, de Onis, M, Ezzati, M, Grantham-McGregor, S, Katz, J, Martorell, R, Uauy, R & the Maternal and Child Nutrition Study Group 2013, 'Maternal and child undernutrition and overweight in low-income and middle-income countries', The Lancet Series, dx.doi.org/10.1016/S0140-6736(13)60937-X.

Black, RE, Allen, LH, Bhutta, ZA, Caulfield, LE, de Onis, M, Ezzati, M, Mathers, C & Rivera, J 2008, 'Maternal and child undernutrition: global and regional exposures and health consequences', *The Lancet Series,* DOI: 10.1016/S0140-6736(07)61690-0.

Bryce, J, Coitinho, D, Darnton-Hill, I, Pelletier, D & Pinstrup-Andersen, P 2008, 'Maternal and child undernutrition: effective action at national level', *The Lancet Series,* DOI: 10.1016/S0140-6736(07)61694-8.

Edirisinghe, J 1986, 'Infections in the malnourished: with special reference to malaria and malnutrition in the tropics', *Ann Trop Pediatrics,* 6:233-237.

Ehrhardt, S, Burchard, GD, Mantel, C, Cramer, JP, Kaiser, S, Kubo, M, Otchwemah, RN, Bienzle, U & Mockenhaupt, FP 2006, 'Malaria, anemia, and malnutrition in African children–defining intervention priorities', *Journal of Infectious Disease*, 194:108-114.

Food and Agricultural Organization 2009, *Ghana Nutrition Profile,* Nutrition and Consumer Protection Division, FAO.

Frimpong, JM & Pongou, R, Does Economic Growth Improve Child Health? Understanding Discordant Trends in Malnutrition Indicators during the Economic Growth in Ghana.

Frimpong, JM & Pongou, R, Impact of Macro-Level Economic Improvement on Child Health: Childhood Malnutrition in Ghana, 1988-2003.

Garcia, V 2012, *Children Malnutrition and Horizontal Inequalities in Sub-Saharan Africa: A Focus on Contrasting Domestic Trajectories,* Working Paper, UNDP, Regional Bureau for Africa WP 2012-019.

Genton, B, Al-Yaman, F, Ginny, M, Taraika, J & Alpers M 1998, 'Relation of anthropometry to malaria morbidity and immunity in Papua New Guinean children', *American Journal of Clinical Nutrition ,*68:734-741.

Ghartey, AB 2010, *Nutrition Policy and Programs in Ghana; the limitation of a single sector approach,* HNP Discussion Paper.

Ghana Districts 2013, *Breakdown of Metropolitant, Municipal and District Assemblies in Ghana,* viewed 18 July 2013, www.ghanadistricts.com.

Ghana Health Service 2013, *Nutrition and Malaria Control for Child Survival*, viewed 25 July 2013, http://www.ghanahealthservice.org/nmccsp.php.

Ghana News Agency (2012), *12,000 children in Ghana die annually of malnutrition,* viewed 10 May 2013, www.ghanaweb.com.

Ghana Statistical Service, Ghana Health Service & ICF Macro 2009, *Ghana Demographic and Health Survey 2008*, Accra, Ghana.

Ghana Statistical Service 2011, *Ghana Multiple Indicator Cluster Survey with an Enhanced Malaria Module and Biomarker, 2011, Final Report*, Accra, Ghana.

Ghana Statistical Service 2012, *2010 Population and Housing Census; Final Results*, Accra, Ghana.

Gillespie, S, Haddad, L, Mannar, V, Menon, P, Nisbett, N & the Maternal and Child Nutrition Study Group 2013, 'The politics of reducing malnutrition: building commitment and accelerating progress', The Lancet Series, dx.doi.org/10.1016/S0140-6736 (13)60842-9.

Gyapong, J, Garshong, B, Akazili, J, Aikins, M, Agyepong, I & Nyonator, F 2007, *Critical Analysis of Ghana's Health System With a focus on equity challenges and the National Health Insurance*, Shield Work Package 1 Report.

Harrison, GA & Waterlow, JC 1990, 'Diet and Disease in Traditional Developing Societies', *Cambridge Univ. Press.*

Hendrickse, R, Hasan, A, Olumide, L & Akinkunmi, A 1971, 'Malaria in early childhood', *Ann Trop Med Parasitol*, 65:1-20.

Holding, PA & Kitsao-Wekulo, PK 2004, 'Describing the burden of malaria on child development: what should we be measuring and how should we be measuring it'? *American Journal of Tropical Medecine & Hygiene*, 71:71-79.

Horton, R & Lo, S 2013, 'Nutrition: a quintessential sustainable development goal, *The Lancet Series,* dx.doi.org/10.1016/S0140-6736 (13)60843-0.

Kabubo-Mariara, J, Ndenge, GK & Kirii, DM 2006, 'Determinants of Children's Nutritional Status in Kenya: Evidence from Demographic and Health Surveys', *Paper Presented at the Centre for the Study of African Economies Conference*, University of Oxford, March 17-21, 2006.

Kwahu South District Health Administration 2011, *Kwahu South District Health Profile 2011*, Unpublished.

Lwambo NJ, Brooker S, Siza JE, Bundy, DA & Guyatt, H 2000, 'Age patterns in stunting and anemia in African school children, A cross sectional study in Tanzania, *European Journal on Clinical Nutrition ,*54:36-40.

Medhin, G, Hanlon, C, Dewey, M, Alem, A, Tesfaye, F, Worku, B, Tomlinson, M & Prince, M 2010, 'Prevalence and predictors of undernutrition among infants aged six and twelve months in Butajira, Ethiopia: The P-MaMiE Birth Cohort', *BMC Public Health*, doi:10.1186/1471-2458-10-27.

Morris, SS, Cogill, B & Uauy R 2008, 'Effective international action against undernutrition: why has it proven so difficult and what can be done to accelerate progress', *The Lancet Series,* DOI:10.1016/S0140-6736(07)61695-X.

National Development Planning Commission 2010, *2008 Ghana Millennium Goals Development Report*, NDPC/GoG, UNDP, Ghana.

Nyakeriga, AM, Troyo-Blomberg, M, Chemtai, AK, Marsh, K & Williams, TN 2005, 'Malaria and nutritional status in children living on the coast of Kenya'. *American Journal of Clinical Nutrition*, 80:1604-10, 82-203.

Olanrewaju, RB & Iyabo, FO 2011, 'Prevalence and Determinants of Malnutrition among Under-five Children of Farming Households in Kwara State Nigeria', *Journal of Agricultural Science*, Vol. 3, No. 3.

Ruel, MT, Alderman, H & the Maternal and Child Nutrition Study Group 2013, 'Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition?' *The Lancet Series*, dx.doi.org/10.1016/S0140-6736(13)60843-0.

Sanawar, SA, Karim, N, Billoo, AG & Sabieh, SH 2005, 'Association of Literacy of Mothers with Malnutrition among Children Under Three Years of Age in Rural Area of District Malir, Karachi', *J Pak Med Assoc*, Vol. 55, No. 12.

Save the Children 2009, *Hungry for Change; an eight-step, costed plan of action to tackle global child hunger*, London, UK.

Save the Children 2012a, *Nutrition in the First 1,000 Days; State of the World's Mothers 2012.*

Save the Children 2012b, *A Life Free from Hunger, Tackling child malnutrition,* London, UK.

Sebastion, MS & Senti, S 1999, 'The health status of rural school children in Amazon Basin of Ecuador', *Journal of Tropical Pediatrics*, 45:379-382.

Seddoh, A, Adjei, S & Nazzar, A 2011, *Ghana's National Health Insurance Scheme: Views on progress, observations and commentary,* Rockefeller Foundation.

Shahabuddin AKM, Talukder, K, Talukder, MQ-K, Hassan, MQ, Seal, A, Rahman, Q, Mannan, A, Tomkins, A & Costello, A 2000, 'Adolescent nutrition in a rural community in Bangladesh', *Indian Journal of Pediatrics*, 67(2):93-98.

Srivastava, A, Mahmood, SE, Srivastava, PM, Shrotriya, VP & Kumar, B 2012, 'Nutritional status of school-age children – A scenario of urban slums in India', *BMC Archives of Public Health*, doi:10.1186/0778-7367-70-8.

Takakura, M, Uza, M, Sasaki, Y, Nagahama, N, Phommpida, S, Bounyadeth, S, Kobayashi, J, Toma, T & Miyagi, I 2001, 'The relationship between

anthropometric indicators of nutritional status and malaria infection among youths in Khammouane Province, Lao PDR', *Southeast Asian Journal of Tropical Medicine Public Health,* 32(2):262-7.

Taylor, A, Dangour, AD & Srinath KR 2013, 'Only collective action will end undernutrition', *The Lancet Series,* dx.doi.org/10.1016/S0140-6736(13)61084-3.

The Harmonized Training Package (HTP) 2011, Resource Material for Training on Nutrition in Emergencies, Version 2, Nutrition Works, Emergency Nutrition Network, Global Nutrition Cluster.

The World Bank 2007, Nutritional Failure in Ecuador Causes, Consequences, and Solutions, The International Bank for Reconstruction and Development/The World Bank.

United Nations Development Programme 2013, *Ghana Country profile: Human Development Indicators*, viewed 12 August 2013, http://hdrstats.undp.org/en/countries/profiles/GHA.html.

United Nations Children's Fund 2009, *Tracking Progress on Child and Maternal Nutrition; A Survival and Development Priority*, NY, USA.

United Nations Children's Fund 2013, *Improving Child Nutrition; The achievable imperative for global progress.*

United Nations System Standing Committee on Nutrition 2010, 'Climate Change and Nutrition Security', *16th United Nations Conference of the Parties (COP16) Cancun, November 29th- December 10th, 2010, Message to the UNFCCC Negotiators,* UNSCN.

United Nations System Standing Committee on Nutrition, *6th report on the world nutrition situation, Progress in Nutrition,* UNSCN.

Van de Poel, E, Hosseinpoor, AR, Jehu-Appiah, C & Speybroeck, N 2007, 'Malnutrition and the disproportional burden on the poor: the case of Ghana', *International Journal for Equity in Health,* doi: 10.1186/1475-9276-6-21.

Victora, CG, Adair, L, Fall, C, Hallal, PC, Martorell, R, Richter, L & Singh, HS 2008, 'Maternal and child undernutrition: consequences for adult health and human capital, *The Lancet Series,* DOI: 10.1016/S0140-6736(07)61692-4.

Williams, T, Maitland, K, Phelps, L, Bennett, S, Peto, T, Viji, J, Timothy, R, Cleg, J, Weatherall, D & Bowden, D 1997, 'Plasmodium vivax: a cause of malnutrition in young children', *QJM*, 90:751-757.

World Food Programme 2009, *Comprehensive Food Security and Vulnerability Analysis, Guidelines*, First Edition.

World Health Organization 2007, WHO *Child Growth Standards: Length/height-for-age, Weight-for-age, Weight-for-length, Weight-for-height and Body mass index-for-age: Methods and Development,* WHO, Geneva.

Young, H & Jaspars, S 2009, *Review of Nutrition and Mortality Indicators for the Integrated Food Security Phase Classification (IPC). Reference Levels and Decision-making*, SCN Task Force on Assessment, Monitoring and Evaluation, and the Integrated Food Security Phase Classification (IPC) Global Partners.

Appendices

Appendix 1: Disaggregated data on breastfeeding and diarrhea by age groups

We further disaggregated breastfeeding by age groups. The results show the rate of breastfeeding decreased with increase in age and is as shown in Table A1

A1: Disaggregated breastfeeding by age groups

Age	Is Child Still Breastfeeding	
	No	Yes
6-11	44	44
12-23	30	68
24-35	96	2
36+	72	0
Percent	63.9 (198)	36.1 (112)

The incidence of diarrhea was also disaggregated by age groups. Incidence of diarrhea was high among all age groups as shown in Table X

A2: Disaggregated incidence of diarrhea by age groups

Age	Diarrhoea	
	No	Yes
6-11	7	37
12-23	17	73
24-35	21	77
36+	6	66
Percent	16.5 (51)	83.5 (259)

Appendix 2: Methodology for survey data collection by KSDHA

Study population and tools

The study populations in this survey were children 6-59 months and their mothers. The tools used to collect data were structured questionnaire and anthropometric measurements.

Sample size and methods

With an expected malnutrition rate of 21% generated from ongoing surveillance data, a sample size of four hundred and twenty six (426) children was selected from the 16,166 children (data from March 2010 NID) less than five years in the District for the survey at a 95% confidence interval. The same methodology was used to generate sample sizes for the various sub-districts. In all, 19 communities were selected and visited for the data collection.

A systematic random sampling methodology was used in the data collection. The number of households with children Under 5 in each study community was obtained and a sampling interval generated based on the number of sampling units to be visited in the community. A house was randomly selected, and starting from that house other houses were visited with respect to the sampling interval. This was done till all the sampling units required were obtained in the community.

Quality assurance and ethical considerations

To ensure quality, field officers were trained for two days and on the third day a pretesting exercise was done. During the survey measurements of each participant was taken twice to ensure no mistakes were made. Ethical clearance for the survey was given by the RHA and the DHMT. Recruitment and participation of the respondents was voluntary and they could withdraw from the survey when they wanted to. This together with the survey objectives were explained to the participants and confidentiality was assured. Each participant consented to take part in the survey.

Description of data collection

The data was collected between 16 and 21 August 2011. In all, six days were used for the data collection. Six nurse interns at the district hospital were recruited as field officers. They all had prior knowledge on how to take anthropometric measurements. Two supervisors were also recruited in the persons of the District Nutrition Officer and the District Disease Control Officer. The field officers were divided into two groups of three. Two in each group were assigned the roles of administering questionnaires whilst the

third in the group was in charge of taking anthropometric data together with the group supervisor. In each community the team used the right channels before they entered the community - greeting chiefs and opinion leaders and informing them on the purpose for the survey and seeking their consent.

Measurements were taken at a place with a flat surface. The interviewers then selected a house randomly and started visiting from house to house using the sampling interval. After a woman had been interviewed, she was given a paper with a code which corresponded with the code on her questionnaire written on it to take to the point where the anthropometry is taken; weight and height measurements of both mother and child were taken. Children below two years of age had their horizontal lengths measured by lying flat on a board. Those above two years and the mother had their vertical heights taken whilst standing on the board. A Mid-Upper Arm Circumference (MUAC) strip was also used to take the MUAC of the children. They were then thanked and encouraged to use the health services regularly.

Appendix 3: KSDHA Nutrition Survey Tool 2011

Nutrition Survey Questionnaire

Date of interview……/……/2011

Community……. Sub-district……

Personal information

1. Name of child……..……
2. Age of child (in completed months) ……
3. Name of mother/caregiver…….……..
4. Traceable address…….……

Anthropometry

5. Weight of child __ __. __ kg
6. Height/length __ __. __ cm
7. MUAC __ __. __ cm
8. Oedema yes…… no…….

Feeding practices

9. Is (name of child) still breastfeeding? Yes……. No……. (If no go to 12)
10. Has (name of child) been breastfed in the last 2 hrs.? Yes…… No……
11. Has (name of child) been given any complementary food in the last 2 hrs.? Yes…… No……..
12. What complementary food has (name of child) taken?.....

Morbidity

Has (name of child) had any of the following conditions in the last 2 weeks?

13. Malaria Yes…… No……..
14. Diarrhoea Yes…… No……..
15. Skin infections Yes…….. No…….
16. Respiratory infections Yes……. No…..
17. Other infections (Specify)…….……

Access to health care

18. What do you do when (name of child) falls sick?
……
……..
19. Where do you take (name of child) when s/he falls ill……..……
20. How far is this place away from you?..... (quote time taken)
21. Is (name of child) insured (NHIS) Yes…….. No…….. (if no go to 23)
22. Are you able to afford the cost of treating (name of child) when s/he falls sick? Yes……. No…….

Maternal Anthropometry

Name of mother…….

Age of mother _____yrs

Weight __ __.__kg

Height __ __.__m

Iodized salt usage

23. What type of salt do you use…… (observe family salt) if not iodized go to 25
24. Have you heard of iodized salt and its benefits Yes…… No…….
25. What are some of the benefits
……
……
……..
26. Why don't you use iodized salt?
.....
.....
.....
.....

Thank you