Predictors of undernutrition in children in Kwahu South District (KSD) of 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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List of Acronym and Abbreviations

AHWO	African Health Workforce Observatory
ARI	Acute Respiratory Infection
CHPS	Community-based Health Planning and Services
CI	Confidence Interval
CSOs	Civil Society Organizations
DALYS	Disability-Adjusted Life Years
DHIS	District Health Insurance Scheme
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
HDI	Human Development Index
HIV	Human Immune Virus
IEC	Information, Education and Communication
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
NHIA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
NIDs	National Immunization Days
OR	Odds Ratio
PEM	Protein Energy Malnutrition
SA	South Asia
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
WFP	World Food Programme
WHO	World Health Organization

Glossary

Body Mass Index (BMI): is the measurement of weight of an adult and is defined as weight in kilograms (Kg) divided by height in in meters squared (Kg/m2). An adult whose weight is below 18.5kg/m2 is classified as thin whereas those with weight from 18.5kg/m2 to 24.9kg/m2 are of normal weight. An adult with weight above 24.9kg/m2 is classified as overweight and above 29.9kg/m2 is obese (UNICEF 2009, 2013; UNSCN 6th Report; WHO 2007).

Food Insecurity: is the inability of people to live fulfilling lives in terms of the type of food they eat, in what quantities, and when and how they get what they want to eat (UNDP 2012; UNICEF 2009, 2013; UNSCN 6th Report).

Food security: is the ability of people to make choices in relation to what they want to eat and when to eat (UNDP 2012; UNICEF 2009, 2013; UNSCN 6th Report).

Height: is indicative of tallness or otherwise (UNICEF 2009, 2013; UNSCN 6th Report; WHO 2007).

Hunger: is a condition/situation whereby food and micronutrient intake is below that required by the body (UNDP 2012; UNICEF 2009, 2013; UNSCN 6th Report).

Malnutrition: refers to an uneven intake of nutrients (UNICEF 2009, 2013; UNSCN 6th Report; WHO 2007).

Stunting: is also referred to as chronic undernutrition. The height-for-age index is indicative of shortness in relation to the age of a person. Children with a height-for-age below minus two standard deviations (-2SD) from the median of the World Health Organization (WHO) reference population are said to be stunted whereas those below minus three standard deviations (-3SD) are said to be severely stunted. An adult with height below 145cm is deemed to be stunted (UNICEF 2009, 2013; UNSCN 6th Report; WHO 2007).

Wasting: is also known as acute undernutrition. The weight-for-height index is indicative of thinness in relation to the height of a person. Children with a weight-for-height below minus two standard deviations (-2SD) are too thin for their height and are said to be wasted. Those that are minus three standard deviations (-3SD) from the median of the reference

population are said to be severely wasted (UNICEF 2009, 2013; UNSCN 6th Report; WHO 2007).

Undernutrition: refers to the interaction between low intake of nutrients, infections and poor caring/hygiene practices (UNDP 2012; UNICEF 2009, 2013; UNSCN 6th Report; WHO 2007).

Underweight: is the condition whereby an individual is light in weight compared to their age. Children with weight below minus two Standard Deviations (-2SD) from the mean weight-for-age measure of a standard reference population are moderately underweight and those below minus three (-3SD) are severely underweight (UNICEF 2009, 2013; UNSCN 6th Report; WHO 2007).

Undernourishment: is when food intake is inadequate to support regular bodily functions. Undernourishment is an index for food insecurity (UNDP 2012; UNICEF 2009, 2013; UNSCN 6th Report; WHO 2007).

Abstract

Introduction

In Kwahu South District, undernutrition is among the top four causes of illnesses in children. Nutrition interventions for children are mainly preventive and delivered at Child Welfare Clinics.

Methods

This study is in two parts; a review of literature and statistical analysis of secondary data using a logistic regression model for 310 children between the ages of 6-59 months.

Findings

The prevalence of stunting and wasting are 22.3% and 19% respectively. Children with health insurance were less likely (OR=0.44, 95%CI 0.21-0.89, p=0.022) to be stunted compared with children not insured. Children taken to a Health Center/CHPS were twice (OR=2.2, 95%CI 0.88-5.49, p=0.05) and those taken to herbalist were fourteen (OR=14.3, 95%CI 1.29-158.04, p=0.030) times more likely to be stunted compared with children taken to the hospital for treatment when ill. Children whose mothers worked in the public sector were about nine times (OR 8.8 95%CI 1.05-74.16, p=0.044) more likely to be stunted compared with children whose mothers occupation was trading. Children of divorced mothers were five times (OR 4.5 95%CI 1.29-15.71, p=0.018) more likely to be stunted compared with children of married mothers. None of the variables was significantly associated with wasting in neither a bivariate nor multivariate logistic regression.

Conclusion

Undernutrition is a public health problem in KSD and urgent action is required to address acute undernutrition in children in the district.

Recommendation

Recommendations include: targeting children of high risk mother groups; extend and increase frequency of Child Welfare Clinics in all health facilities; increase collaboration with the Department of Agriculture and District Insurance Scheme; and introduce Community Management of Acute Malnutrition in the district.

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

Word Count: 11,987

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Thank you all.

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 a 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 are trapped in a vicious cycle of undernutrition and infections. Despite trends showing decreasing prevalence of stunting and wasting in Ghana, protein energy malnutrition (PEM) persists. 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 (KSDHA) to inform evidence based nutrition and related health interventions. The choice of the topic and district is motivated by: having previously worked on a health intervention programme for Under 5s at the district level; having family members' resident in the district; and having worked on two research projects in Kwahu South District (KSD). By this, I also hope to contribute to the academic literature on nutrition. This thesis consists of two parts, a literature review and an analysis of secondary data. The data for analysis is by courtesy of the Kwahu South District Health Administration (KSDHA).

The thesis is organized in the following manner: Chapter one gives an introduction on the socio-demographic and health profile of Ghana and the study area; concepts of undernutrition including trends in global, national and district prevalence are also explored. Chapter two describes the problem statement, justification and study objectives. A literature review on the determinants of undernutrition is explored in chapter three. The results from a logistic regression analysis are presented in chapter four. These results are discussed in chapter five and recommendations proposed to Kwahu South District Health Administration (KSDHA).

1 Chapter 1: Country, and district background and introduction to undernutrition

1.1 Geography, demography and economy

1.1.1 Overview of Ghana

Ghana has a population of twenty-seven million people with about fifty-one percent (50.9%) being males and forty-nine percent (49.1%) females (GSS, 2015). Ghana is divided into ten administrative regions as shown in Figure 1. There are 216 districts functioning under the regions (Ghana Districts, 2013). The Gross Domestic Product (GDP) of Ghana is US $38.65 billion (World Bank, 2015). Life expectancy in Ghana is sixty-one years. As shown in Table 1, Ghana's human development indicators compare favourably with the regional averages for Sub-Saharan Africa (SSA) (UNDP, 2013).

Figure 1: Map of Ghana
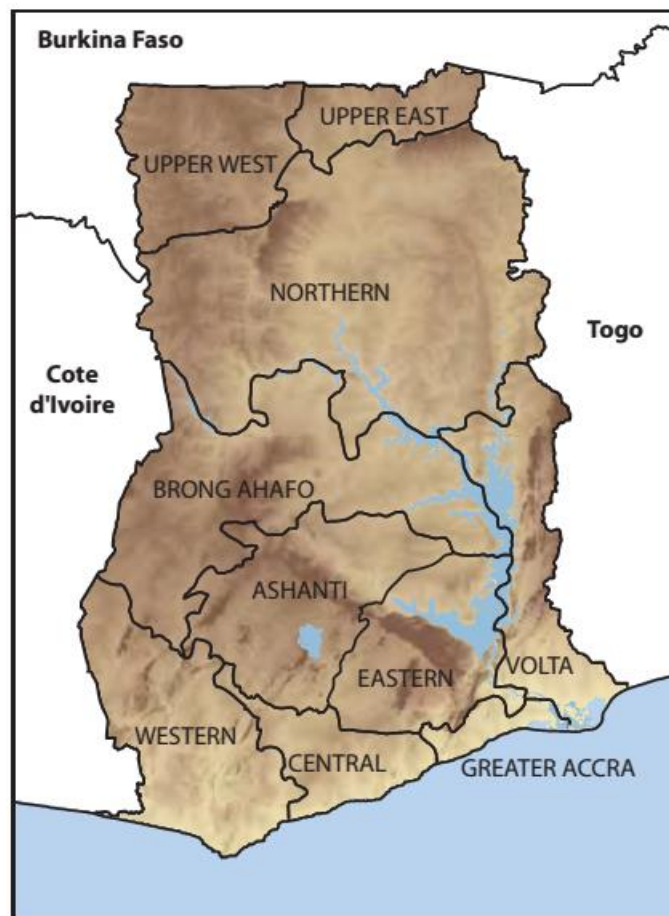
Source: ICF Macro 2010

Table 1: Ghana's economic and human development indicators

Indicators	Rate		Year	Source
	Ghana	SSA		
GDP	$ 38.65 billion		2014	World Bank, 2015
GDP growth (%)	3.5%		2015	World Bank, 2015
Life Expectancy at birth (total years for both sexes)	61	54.9	2013	UNDP, 2013; World Bank, 2015
Poverty headcount ratio at national poverty line (% of population)	24.2%		2012	World Bank, 2015
Expected years of schooling	11.4	7.0	2013	UNDP, 2013
Mean years of schooling	9.3	4.7	2013	UNDP, 2013
Adult literacy rate, both sexes (% 15 years and above)	67.3%			UNDP, 2013
Gender inequality index	0.565	0.577	2013	UNDP, 2013
Expenditure on health, public (% of GDP)	5.4%		2013	WHO, 2015
Public expenditure on education (% of GDP)	5.5%			UNDP, 2013
Human Development Index (HDI)	0.558	0.475	2013	UNDP, 2013
Non-income HDI	0.646		2013	UNDP, 2013

1.1.2 Overview of Kwahu South District (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. Most of the communities in the district are located on top of the ridge (KSDHA, 2011). The size of the district is 1,462 kilometers square (Ghana Districts, 2013). Average annual rainfall in the district is between 1,670 to 1,799 millimeters. Most parts of the district are heavily forested (KSDHA, 2011). The population of KSD is estimated at 75,804 (KSDHA, 2014). The district is mainly rural with a few semi-urban centers. The Kwahus (66%) is the largest ethnic group in the district. The other dominant ethnic group is the Ewe (15%) (KSDHA, 2011).

Fifty-four percent (54%) of the overall labour force in the district is engaged in subsistence farming. Crops grown are plantain, maize, yam cassava, onions, pepper and tomatoes. The Afram River, a tributary of the Volta Lake, provides opportunities for tilapia farming. Public sector workers comprise

fifteen percent (15.5%) of the working population of the district. Service and industry are the other important sectors in the district (KSDHA, 2011).

1.2 Health

1.2.1 Governance of the health sector and disease burden in Ghana

Management of the health sector in Ghana is at three levels – national, regional and district. The Ministry of Health (MOH) is responsible for the overall health sector performance. Health services are organized at five levels; the Teaching Hospitals (operating under the authority of the MOH) provide tertiary care; Ghana Health Service (GHS) provides care at the secondary and primary levels. Figure 2 illustrates the governance structure and organization of health services in Ghana. The Community-based Health Planning and Services (CHPS) Compounds is designed to increase community involvement in planning and service delivery (AHWO, 2010; Gyapong et al., 2007).

Ghana's burden of disease in relation to disability-adjusted life years (DALYS) in order of magnitude is as follows: maternal, neonatal and nutrition diseases; HIV, TB and malaria; other infectious diseases; and other non-communicable diseases (NCDs). Malaria accounts for twenty percent (20%) of deaths in Under-5s, this is followed by prematurity (14%), acute respiratory infections (ARI) (13%), birth asphyxia (12%) and diarrheal diseases (8%) (WHO, 2015). Under 5 mortality rate in Ghana is 78/1000 livebirths (GSS, GHS & ICF MACRO, 2015) as detailed in Table 2 together with selected child health indicators. Thirty-six percent (36.8%) of Ghanaians are eligible to access healthcare (actively subscribed) under the Ghana National Health Insurance Scheme (NHIS) (NHIA, 2012).

Figure 2: Management and organization of health services in Ghana
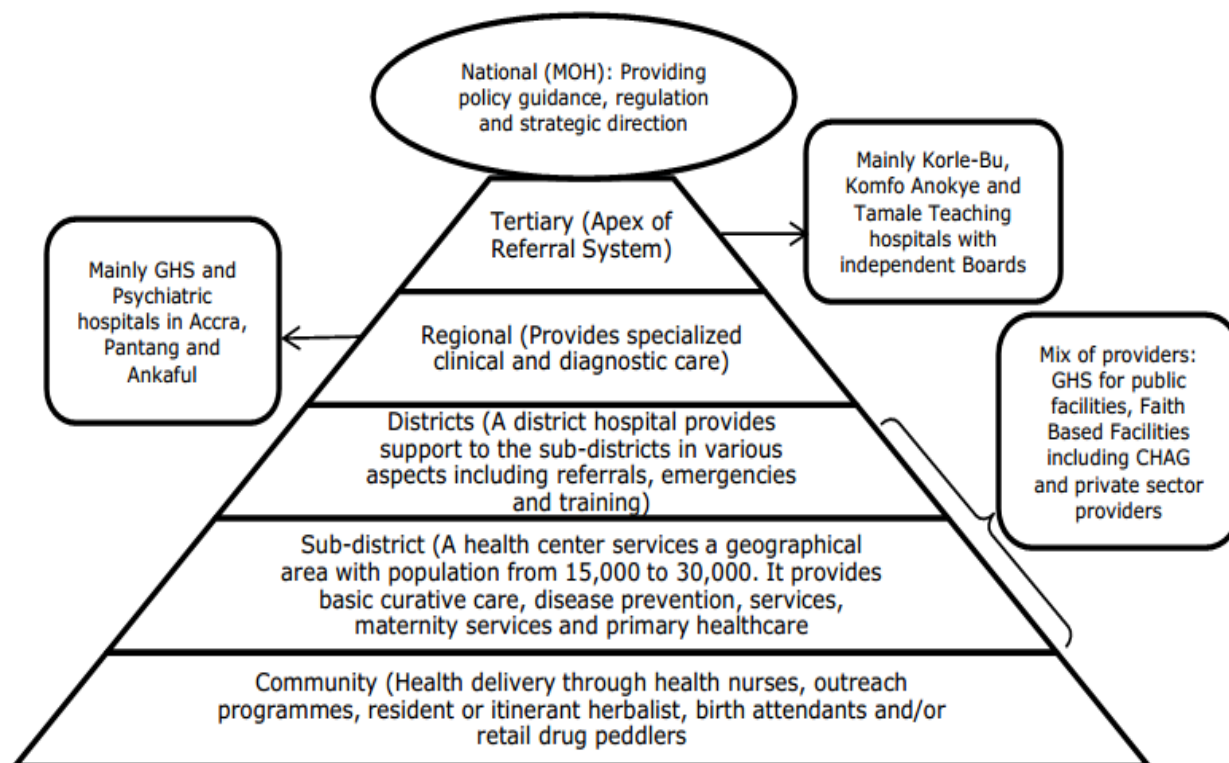
Source: Seddoh, Adjei & Nazzar, 2011 cited in Gyapong et al., 2007

Table 2: Selected child health indicators for Ghana

Indicators	Rate
Under 5 mortality Rate (/1000 live births)	78
Infant Mortality Rate (/1000 live births)	41
Child mortality rate	19
Ante Natal Care (4+ visits) coverage	87%
Post Natal Care coverage	78%
Measles immunization (1 year olds)	89%
Immunization (BCG)	77%
Births attended by skilled health personnel	73%
Source: GSS, GHS & ICF MACRO, 2015	

1.2.2 Governance and disease burden in KSD

As a devolved agency, Kwahu South District Health Administration (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. In total there are eighteen GHS health facilities in the district; one district hospital, six health centers and eleven CHPS compounds; a maternity home is the only private health

facility in the district. Overall, the district has 279 health workers (KSDHA, 2014)

The disease burden of KSD in order of magnitude is malaria, diarrhea, acute respiratory infections (ARI), malnutrition, skin diseases, intestinal worms, anemia, road traffic accidents and others (KSDHA, 2011). Expanded Programme on Immunization (EPI) coverage in the district is ninety percent (90%) (KSDHA, 2014).

1.3 Introduction to undernutrition and trends in prevalence

1.3.1 Nutrition concepts

Undernutrition and overnutrition together is generally termed as malnutrition. Undernutrition can occur as macro or micronutrient deficiencies in the form of stunting, wasting, underweight and ailments attributed to vitamin and mineral deficiencies. Hunger in the form of inadequate food and micronutrients are the result of food insecurity and leads to undernutrition . In these forms undernutrition may lead to death or manifest in the form of deformity and disability (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 the World Health Organization (WHO) reference population (Black et al., 2008; UNICEF, 2009, 2013; Young & Jaspers, 2009).

Stunting is the effect of a persistent deprivation of essential nutrients (fats, carbohydrates, proteins, zinc, Vitamin A and iron) and frequent episodes of diseases over time (Black et al., 2008; Garcia, 2012; Young & Jaspers, 2009) and can occur before birth. If not detected early, a child may not recover from stunting (Victora et al., 2008; Young & Jaspers, 2009). When a child's height-for-age anthropometric indices fall below minus two standard deviations (SD) compared with the standard reference population, the child is stunted (UNICEF, 2009, 2013; UNSCN, 6th Report; WHO, 2007).

When children fail to amass or lose weight, they are 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 (with fats, carbohydrates, proteins, sodium, magnesium, zinc and phosphorus) and this may be due to food shortages. Children suffering from diarrhea and measles are more likely to be wasted (Bhutta et al., 2008; Garcia, 2012; Save the Children, 2012b; Young & Jaspers, 2009). Weight-for-height below minus two SD in reference to the standard population is wasting (UNICEF, 2009, 2013; UNSCN, 6th Report; WHO, 2007).

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 short stature. Determination of underweight involves a process of monitoring through growth charts for it can be an indication of current or past nutritional deficiencies (Young & Jaspers, 2009). Weight-for-age anthropometric measurement below minus two SD compared with the standard reference population is underweight (UNICEF, 2009, 2013; UNSCN, 6th Report; WHO, 2007).

The adverse effects of undernutrition are calamitous for an individual and the health system at large. Undernourished children are vulnerable and more likely to suffer recurrence of infections, which inhibits their physical development. Malnourished children most often are also lethargic and docile. This may affect them academically resulting in average performance and may result in discontinuation of education. Adverse effects of undernutrition during the early years of life may continue into late childhood (overweight) and adulthood in the form of NCDs such as hypertension, heart diseases and diabetes (Bhutta et al., 2013; Black et al., 2008, 2013; Horton & Lo, 2013; Save the Children, 2012a, 2012b; UNICEF, 2009, 2013; Victora et al., 2008).

The financial implications of undernutrition on the health sector and on individuals are huge. The health sector requires vast amounts of investments in provision of nutrition related clinical care and preventive services. Undernutrition decreases the productive capabilities of individuals and nations. As mentioned of the effects of undernutrition on education, semi-skilled or less educated people are likely to earn lesser income and sick workers will require more days off work. These individuals are then also more likely to spend more on healthcare potentially resulting in catastrophic health expenditures (Black et al., 2008; Save the Children, 2012a, 2012b; UNICEF, 2009, 2013; Victora et al., 2008).

1.3.2 The evolving nutrition landscape

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, in the aftermath of the formation of the Scaling-Up Nutrition (SUN) movement in 2010 (Gillespie et al., 2013; UNICEF, 2013).

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 et al., 2013). The clarion call in the nutrition community 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 of undernutrition (Bhutta et al., 2013; Black et al., 2013; Taylor, Dangour & Srinath, 2013).

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. Health systems and nutrition programmes stand to benefit mutually if they work in harmony Bryce et al., 2013; Gillespie et al., 2013; Ruel & Alderman et al., 2013) . 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 (Black et al., 2013; Bryce et al., 2013; Gillespie et al., 2013; Ruel & Alderman et al., 2013).

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 multi-sectoral responses. That strengthening institutions will improve monitoring and evaluation of nutrition programmes 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 & Alderman et al., 2013).

1.3.3 Global prevalence and trends of undernutrition

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 SSA; thirty-nine (39%) in SA and forty percent (40%) in SSA. A two percent (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, fifty-two million Under 5s worldwide were affected in 2011; sixteen percent (16%) in SA and nine percent (9%)

in SSA. Between 1990 and 2011 the global prevalence of wasting had decreased by eleven percent (11%); though this includes SSA, 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; fifty-nine million (33%) in SA and thirty million (21%) in SSA. Between 1990 and 2011 the global prevalence of underweight has been reduced by thirty-seven percent (37%) (UNICEF, 2013).

1.3.4 Nutrition in Ghana
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 its strategic policy document, "Creating Wealth through Health". The document prioritized nutrition and set out to reduce future inequalities in health and economic potentials resulting from undernutrition (Bahwere et al., 2011; GHS, 2013; Van de Poel et al., 2007). The Health Sector Medium Term Development Plan (HSMTDP) 2010-2013, details the MOH's current action plan on nutrition (GHS, 2013). Development Partners (DPs), Civil Society Organizations (CSOs) and Non-Governmental Organisations (NGOs) are all actively involved in piloting of community based nutrition interventions throughout the country (Bahwere et al., 2011; Ghartey, 2010; UNDP, 2012).

The GHS and MOH together with development partners have implemented various interventions ranging from nutrition clinical care to feeding programmes. Micronutrient supplementation interventions and growth monitoring and promotion are mandatory in all districts nationwide. On the other hand, supplementary and therapeutic feeding, nutrition rehabilitation programmes and Community-based Management of Acute Malnutrition (CMAM) are implemented in only selected districts. Other nutrition programmes implemented are capacity building programs and the Ghana School Feeding Programme (Bahwere et al., 2011; Ghartey, 2010; GHS, 2013; NDPC, 2010).

The national averages of undernutrition disguise wide disparities between the regions and among the different socio-economic strata. There is a high prevalence of protein energy malnutrition (PEM) in children and women in Ghana (FAO, 2009; GHS, 2013; GSS, GHS & ICF MACRO, 2015; NDPC, 2010). Stunting is more prevalent in boys (20%) than girls (17%) and between rural (22%) and urban areas (15%). Regional prevalence of stunting is striking; at ten percent (10%) in Greater Accra Region in the south rising to thirty-three percent (33%) in the Northern Region. Stunting is higher in younger children within the age range of two years (28%). Furthermore, the prevalence of stunting is higher (25.6%) in children with uneducated mothers than children whose mothers have secondary or higher

education (3.6%). Likewise, children whose mothers are in the two lowest wealth quintiles are more stunted (25%) than those in the highest wealth quintile (9%) (GSS, GHS & ICF MACRO, 2015).

Wasting is more prevalent in younger children between 6-11 months old (10-11%). There are marked differences in the geographical prevalence of wasting in children Under 5, highest in the Upper East Region at nine percent (9%) and lowest in the Volta Region at two percent (2.5%); and highest in rural areas (13%) than urban areas (9%). Children born to uneducated women are just as wasted (5.2%) as those born to women with secondary education and higher (5.0%). Prevalence of wasting is higher in the lowest wealth quintile at 6.2% (GSS, GHS & ICF MACRO, 2015).

In Ghana, differences in prevalence of underweight among children based on child demographics and socio-economic determinants are marginal. However, regional differentials exist; the prevalence of underweight is highest in the Northern Region at twenty percent (20%) and lowest in the Brong Ahafo Region at six percent (6%) (GSS, GHS & ICF MACRO, 2015).

1.3.5 Nutrition in KSD

Nutrition interventions in KSD include food demonstrations (as part of outreach and IEC activities), nutrition counselling, micro nutrient supplementation (Vitamin A, iodized salt, iron and deworming), growth monitoring and promotion, child health weeks and refresher training for midwives and clinicians on 'Management of Nutritional Challenges of the Newborn'. Nutrition activities for children in the district are mainly conducted during Child Welfare Clinics (CWCs) and Post-natal Care (PNC) sessions albeit in selected facilities. The components of the nutrition programme in the district are mainly preventive interventions and locally initiated (KSDHA, 2011, 2014).

The KSDHA has also implemented a surveillance programme which is undertaken during child health week celebrations whereby children are screened using MUAC tapes and those below the recommended cut-off points are referred to a sister district (Kwahu West) or the regional Hospital for support (KSDHA, 2011, 2014).

The KSDHA collects routine data on the nutritional status of children. The main indicator looked out for and for which data is collected is weight-for-age because it is easy to obtain, and does not need any specialized equipment to collect (KSDHA, 2011, 2014).

Available data from the routine activities indicate a stuttering decline in the prevalence of underweight among children in the district. Figure 3 pertains to a run chart of the prevalence of underweight in the district from 2007 to 2010 (KSDHA, 2011).

Figure 3: Trends in underweight prevalence in KSD

Underweight rates W/A (Z-score ≤-3 to ≤-2)

Source: KSDHA, 2011

2   Chapter 2: Methodology

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, three to five million deaths and eleven percent (11%) of the total disease burden as measured by 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 forty percent (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 billion (GHS, 2013).

The national average for stunting in Under 5s is nineteen percent (19%). Prevalence of wasting for children Under 5 is five percent (5%) and that for underweight is eleven percent (11%) (GSS, GHS & ICF MACRO, 2015).

Weight-for-age data generated from growth monitoring sessions placed underweight rates for children 6-59 months in KSD at 20%, and far above the national average (KSDHA, 2011). Furthermore, five percent (5.27%) of all children born in the district are LBW (KSDHA, 2014). Against this background, KSD presents an interesting case study to determine the causes of this inhuman canker in children in the district.

2.2   Justification

Undernutrition is an important determinant of child and maternal health. It continues to be a major public health and developmental concern with serious health and socio-economic consequences (UNICEF, 2009). It is instructive to state that being underweight confers an additional risk of mortality from infectious diseases in children younger than five years (Black, Morris & Bryce, 2003). For instance, undernutrition is implicated in fifty-two percent (52%), fifty-seven percent (57%) and sixty-one percent (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). The economic effects of undernutrition are damaging and broad; the productive potential of a malnourished person is diminished by twenty-two percent (22%) and $20 to $30 billion of the global economy is lost each year due to malnutrition. High prevalence countries lose two

percent (2%) to three percent (3%) of their GDP annually (Save the Children, 2012a, 2012b; UNICEF, 2009, 2013).

Therefore, good nutrition is a determinant of life in terms of the number of years lived and of the quality of life lived during these years (Save the Children, 2012a). Optimally nourished children, presumably, enjoy good health in the present and have higher prospects of living fulfilling future lives (UNICEF, 2009). Thus, good nutrition is equated to prosperity of a nation and its citizens (Save the Children, 2012a).

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; UNICEF, 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 very scant, this therefore makes planning for and executing of locally initiated interventions difficult. A high disease burden exacerbated by socio-cultural and environmental factors results in high undernutrition prevalence among children especially since the district is not privileged to any therapeutic, supplementary feeding and nutrition rehabilitation programmes from the government, and private sectors and donor community. Traditionally, KSDHA does not undertake surveys in the area of undernutrition amongst children. It usually depends on routine data collected during CWCs and Child Health Weeks, which however is lacking in terms of the indicators for chronic and acute undernutrition (KSDHA, 2011, 2014). In view of this, any attempt that seeks to provide or disaggregate data on nutrition to aid in informed decision making in the district is imperative.

2.3 Objectives

2.3.1 General objective
To determine the association between nutritional status of children 6-59 months and determining factors, in KSDHA of Ghana, and to develop recommendations to improve nutrition related interventions in the district.

2.3.2 Specific Objectives
  I.   Describe the determinants of undernutrition in Ghana;
  II. Determine the association between the nutritional status of children 6-59 months and determining factors in the district;

III.   Discuss the implications of these findings on nutrition programming in the district and identify gaps in the current programming;

IV.   Review evidence on strategies to address the identified gaps in order to make recommendations to the KSDHA.

2.4 Focus of this study

Stunting has emerged as the preferred indicator for measuring undernutrition (Black et al., 2013; Morris, Cogill & Uauy, 2008; 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). Stunting is a chronic condition and can occur right from conception hence imperative to focus on the Window of opportunity (the Window of Opportunity is from pregnancy to when a child is two years old (Black et al., 2013; Bryce et al., 2008; Save the Children, 2012a; UNICEF, 2009, 2013).

Wasting has equally been accorded importance as an indicator for measuring undernutrition. Severe Acute Malnutrition (SAM) in the absence of essential medical care may directly lead to death in children. Not only is wasting used as a measure of the food security situation, it also serves an indicator of the current nutritional status of a population. Prevalence of wasting may provide an indication on child feeding and caring practices and of the current state of children's health of a population (Black et al., 2008; Save the Children, 2012a, 2012b; UNDP, 2012; UNICEF, 2009, 2013).

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 and wasting as the preferred indicators for monitoring undernutrition. It is for these reasons that this paper exclusively focuses on stunting and wasting.

Chapter three details the description of the broad determinants of stunting and wasting in Ghana – that is the interactions between these determinants and the processes through which they cause undernutrition. The contribution of these determinants to child stunting and wasting in KSD are explored in chapter four and to ascertain if they are concurrent with national findings, thus addressing specific objective two. The severity of stunting and wasting and their most important determinants as determined by the multivariate analysis are discussed in chapter 5. The literature review conducted is used as evidence. Current efforts at addressing these most important

determinants in the district are reviewed and remedies proposed, addressing specific objectives three and four.

2.5 Literature review

A literature review was conducted on the determinants of undernutrition. Databases searched for published peer reviewed literature included Scopus, Google Scholar and Pubmed. The keywords and their combinations used were: malnutrition, undernutrition, stunting, wasting, underweight, Ghana, determinants, undernutrition and infections, immediate causes, underlying 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, NGOs and Development Institutions are also used.

The literature review informed the selection of variables for analysis.

2.5.1 Conceptual framework on the determinants of undernutrition

The adapted UNICEF conceptual framework (2013) on undernutrition is used to support the literature review. The framework is a three tier construct and analyses the causes of undernutrition from the perspectives of direct, intermediate and basic factors (Benson, 2005; UNICEF, 2013).

The following reasons informed the choice of selection of this framework:

1. The UNICEF framework is generally accepted as the reference model and has provided the basis for the development of other undernutrition frameworks (UNICEF, 2013).
2. 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).
3. The revised UNICEF framework of 2013 also captures maternal undernutrition as an important factor to ensuring adequate child nutrition. This had been a gap in the original UNICEF conceptual framework (UNICEF, 2013).

Figure 4: Conceptual framework of the determinants of undernutrition
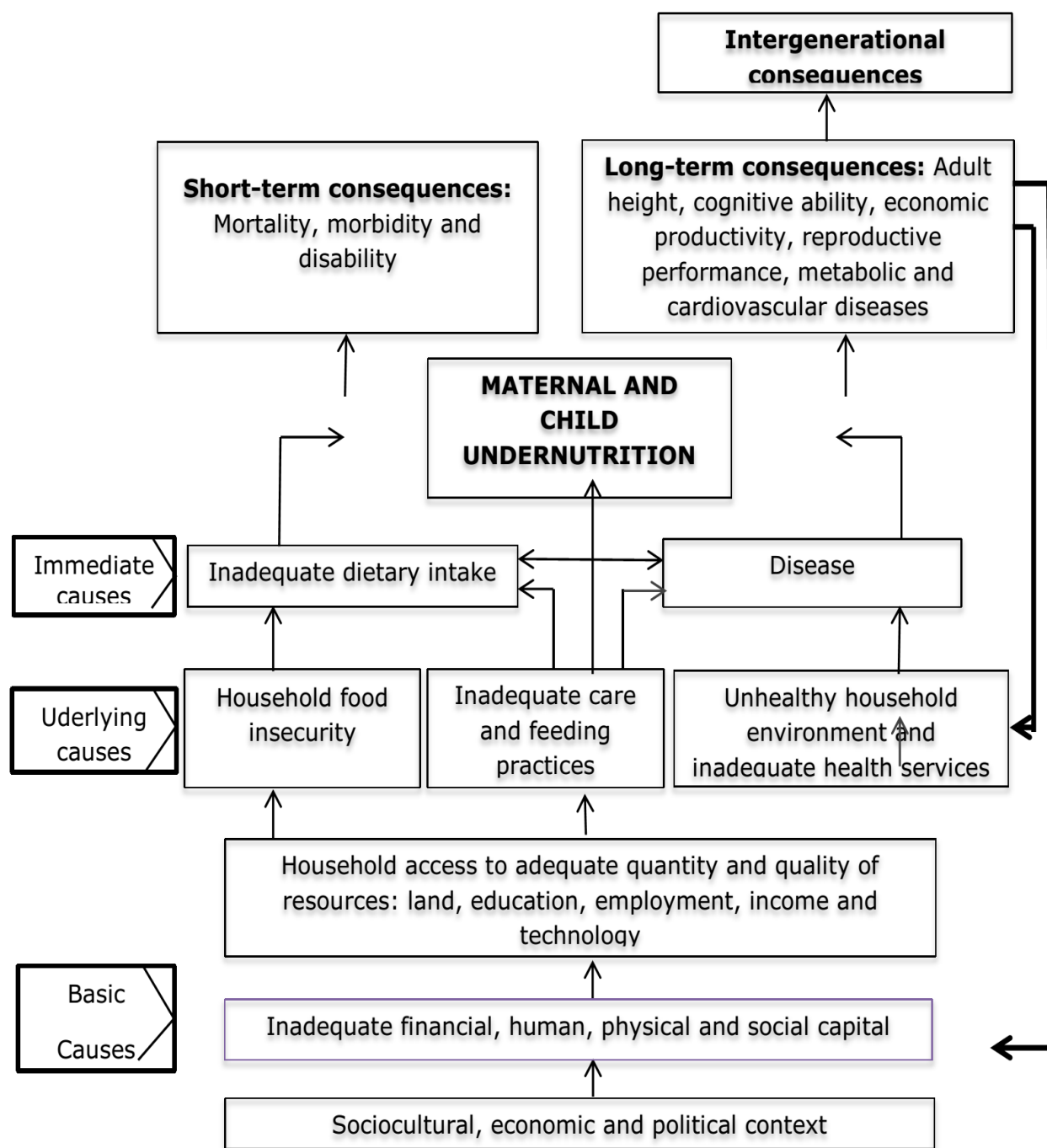
The black arrows show that the consequences of undernutrition can feed back to the underlying and basic causes of undernutrition, perpetuating the cycle of undernutrition, poverty and inequities.

Source: UNICEF, 2013, adapted from UNICEF, 1990

2.6 Statistical analysis of secondary data

With funding, logistic and technical support from the United Nations Children's Fund (UNICEF) country office, the survey was carried out by the KSDHA among a systematically randomly selected sample of 426 children at a 95% confidence interval - from a total of 16,166 children aged 6-59 months identified during the March 2010 National Immunization Day (NID). Data collection took place in August 2011 for six days in twenty communities. Data collectors had prior experience of taking anthropometric measurements and included six nurses from the district hospital, and the District Nutrition and Disease Control Officers.

Anthropometric measurements for both children and mothers were taken. Instruments used included; a UNISCALE for taking paired measurement of children and mothers; an Infantometer for measuring height of the children; and a Stadiometer also for height measurements. A structured questionnaire was used for collecting data on child and mother demographics and socio-economic information.

KSDHA made the data available for the purpose of this study. The data set consisted of data on 420 children. Due to incomplete anthropometric records, 110 children were dropped from the analysis and the final sample consisted of 310 children. The WHO Child Growth Standards of 2007 are used to determine the nutritional status of children and mothers in this analysis. Children weighing below -2 SD are stunted or wasted and below -3 SD are severely stunted or wasted respectively. A mother's BMI below 18.5kg/m2 is an indication of thinness, whereas a BMI of 25-29.9kg/m2 indicates overweight and above 30kg/m2 2 indicates obesity. Those within 18.5kg/m2 to 24.9kg/m2 are said to be normal (WHO, 2007).

STATA 11 was used for logistic regression analysis and covariates included to adjust for confounding. Statistical significance was set at P-value <0.05. Variables were included in the logistic regression analysis if they were directly related to or could inform the objectives of this study. To explore relationships between the age of children and feeding practices (breastfeeding and complementary feeding) and infections, simple analysis using percentages were initially done, followed by bivariate and multivariate logistic regression.

3 Chapter 3: Literature review

3.1 Determinants of undernutrition in Ghana

This section draws on literature from Ghana to analyze the broad determinants of undernutrition according to the conceptual framework presented in Figure 4. Ideally, data on KSD or its surrounding areas should be presented as well, this is however not available.

3.1.1 Immediate determinants

Immediate determinants directly lead to undernutrition in children. These factors interact with each other at the person level.

3.1.1.1 Inadequate dietary intake

For children that are still being breastfed, when the *quality* and *quantity* of breast milk is compromised, it increases the risk of *suboptimum* breastfeeding and may consequently lead to adverse nutrition outcomes. When children are denied the benefits of either *exclusive or extended duration of breastfeeding,* it negatively affects their nutrition and reduces their immunity to fight infections leading to adverse health outcomes (Black et al., 2008). For instance, in Ghana, only fifty-two percent (52%) of children less than six months are being breastfed exclusively far below that recommended by the WHO. Furthermore, forty-one percent (41%) of children are weaned in Ghana before their second birthday (GSS, GHS & ICF MACRO, 2015).

Children below two years (those being fed with complementary foods) 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 undernourished (Black et al., 2008; Save the Children, 2009; UNICEF, 2013; UNSCN, 6th Report). The *timing* of introduction of weaning 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 weaning and complementary foods are usually inaccessible to most deprived families leading to *sub-optimum* feeding of children. Complementary and weaning foods also expose children to substantial risks of infection through food contamination (Black et al., 2008; UNICEF, 2013; UNSCN, 6th Report). Feeding practices for children Under 5 in Ghana are inappropriate and less frequent. It is disheartening to mention that children between 6-23 months old in Ghana are not being fed the minimum acceptable diet, a mere thirteen percent (13%) are fed according to the Infant and Young Child Feeding (IYCF) practices (GSS, GHS & ICF MACRO, 2015).

3.1.1.2   Diseases

Infection 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., 2008, 2013; UNICEF, 2013). About seven in every ten children in Ghana (66%) are anaemic (GSS, GHS, ICF Macro, 2015).

Though severe forms of undernutrition may directly lead to death, the interaction of diseases with moderate undernutrition is noted to result in more deaths and disability. Infections in malnourished young children may be lethal, more intense and may take longer time to heal. These infections also lead to loss of appetite resulting in low food intake and consequently undernourishment.   Children become trapped in a cycle of persisting undernutrition and ill health as shown in Figure 5 (Black et al., 2008; UNICEF, 2009, 2013). It has been found that underweight children in some parts of northern Ghana are 1.67 times more likely of developing clinical malaria than well-nourished children (GHS, 2013).

Figure 5: Infection-undernutrition cycle
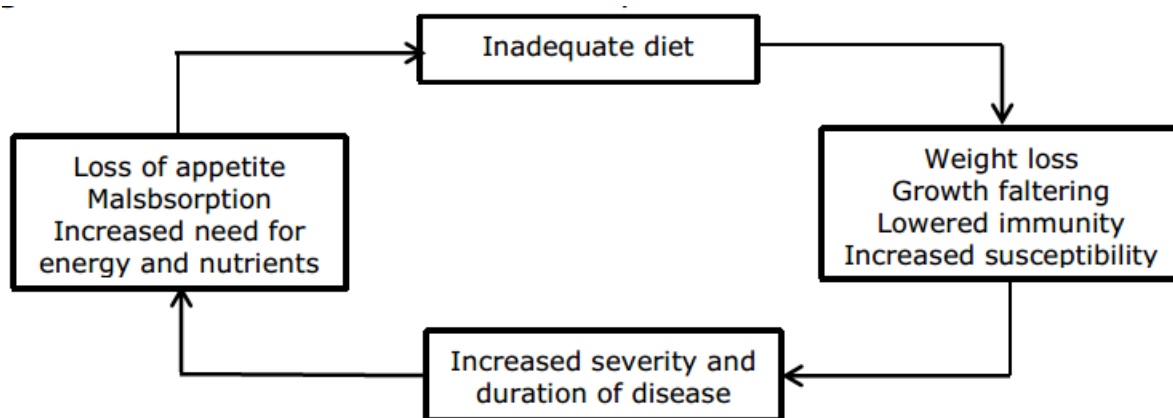
Source: Harmonized Training Package, 2011

3.1.2 The underlying determinants

Underlying determinants are usually related to factors at the household level and often portray the level of resources within a household.

3.1.2.1   Household food insecurity

Food scarcity either due to seasonality or low production drive food prices upwards. Poor households adapt by cutting expenditure on vital non-staples and animal based foods. Furthermore, poor households are faced with a dilemma of spending more 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). Despite national food sufficiency, five percent (5%) of Ghanaian households are thought to be food insecure and a further nine percent (9%) are at risk of being food insecure (NDPC, 2010).

3.1.2.2 Inadequate feeding and caring practices

Caring and feeding practices underlie nutritional status. In most SSA countries the diet of children, like that of adults, is monotonous and hardly varies. It could be that caregivers 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 only grains (Save the Children, 2012a; UNICEF, 2013, UNSCN, 6th Report).

Poor feeding practices may also be attributable to commitments of work and lack of knowledge on appropriate quality foods (Save the Children, 2012a). Labour regulations and workplace environments are often not favourable for breastfeeding. Mothers are compelled to switch to breast milk substitutes some of which are innutritious; the longer time spent at work may also imply less attention and care for children (Bhutta et al., 2013; Gillespie et al., 2013). Proper child care during illnesses is vital in ensuring quick recovery and less nutrient loss. Nutrition of children is affected when caregivers do not know how to adequately cater for and the type of food to feed them when they are sick (Bhutta et al., 2013; Gillespie et al., 2013; UNDP, 2012) Eighteen percent (18%) of infants below six months in Ghana are given water and a further nineteen percent (19%) fed with solid and semi-solid foods respectively (GSS, GHS & ICF MACRO, 2015).

A woman with *many* children is presumed to be experienced in good feeding and caring practices and vice versa. Having more than one child Under 5 years may however be detrimental due to divided attention and in poor families' insufficient food resources for all the children (Frimpong and Pongou, no date; UNSCN, 6th Report). Children per woman ratio in Ghana range from 5.5 in rural areas to 3.4 in urban areas. Food resources for poor families are thus stretched (GSS, GHS & ICF MACRO, 2015).

Cultural norms play significant roles in feeding practices of children (Save the Children, 2012a, 2012b). In some African societies, traditional beliefs to a great extent determine the choice of food and caring practices for children and in most instances the advice of the maternal grandmother takes precedence (UNDP, 2012). For instance in some communities in Ghana, it is

a taboo to feed children with eggs for it is believed that they will grow to become thieves. Also in some communities it is believed that SAM and anaemia are caused by supernatural forces hence children with these conditions are taken to traditional healers for treatment instead of the health facilities (Ghartey, 2010).

3.1.2.3 Unhealthy household environment and inadequate health services

Unhealthy household environment: Unhealthy living environments are a precursor to infections. Poor sanitary conditions compromise personal hygiene and also lead to food contamination. Children have weaker immune systems hence more susceptible to infections which consequently affect their nutrition. Poor food hygiene may result in innutritious meals leading to hidden hunger (UNICEF, 2009, 2013; Save the Children, 2012; Van de Poel et al., 2007). 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 (NDPC, 2010).

Inadequate health services: Health services in developing countries are saddled with problems of access (geographical and financial). Distance is an impediment to access of health services especially in rural settings were few health facilities serve large geographical areas, people have to travel long distances to get to a health facility (Save the Children, 2012a). Fee for service also dissuade people from seeking care at health facilities especially for people with no health insurance. People resort to home management of illnesses resulting in late presentation of cases at health facilities. Children are the worst affected and especially for those suffering from SAM, this could lead to dire consequences (Frimpong and Ponguo, no date; Save the Children, 2012a). Only twenty-seven percent (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 (GHS, 2013). 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).

Health workers may also not be adequately trained on nutrition. 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). Health systems of most African countries are generally inefficient and unresponsive especially to nutrition related conditions (Bryce

et al., 2008; Ruel & Alderman et al., 2013; Save the Children, 2012a). In Ghana, health workers with technical training on nutrition opt to work in other disease control programmes due to limited resources available for nutrition programmes. Also, the impact of the work of graduate nutritionists in the public sector is limited as their job descriptions mainly require them to perform more of office duties and less of field work (Ghartey, 2010).

3.1.2.4   Maternal age and nutrition

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). For instance over half of the cases of stunting start from the womb (Black et al., 2013; UNICEF, 2009, 2013; UNSCN, 6th report). Maternal undernutrition together with micronutrient deficiencies and infections increases the risk of intergenerational transfer of undernutrition through fetal growth restriction and LBW (Bhutta et al., 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 6 (Bhutta et al., 2013; Save the Children, 2009, 2012a; UNICEF, 2013; UNSCN, 6th report). Short intervals between births can also adversely affect the nutritional status of children (Bhutta et al., 2013; Frimpong and Pongou, no date). 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).

For every ten births in Ghana, one child weighs less than 2,500 grams (11% LBW prevalence) (MICS, 2011). This high prevalence of LBW may be attributable to; the high birth rate among teenagers (child bearing among teenagers 15-19 years is 14%) (GSS, GHS & ICF MACRO, 2015); and a high fertility rate among adolescents (60/1000 live births) (MICS, 2011).

Figure 6: Intergenerational cycle of growth failure
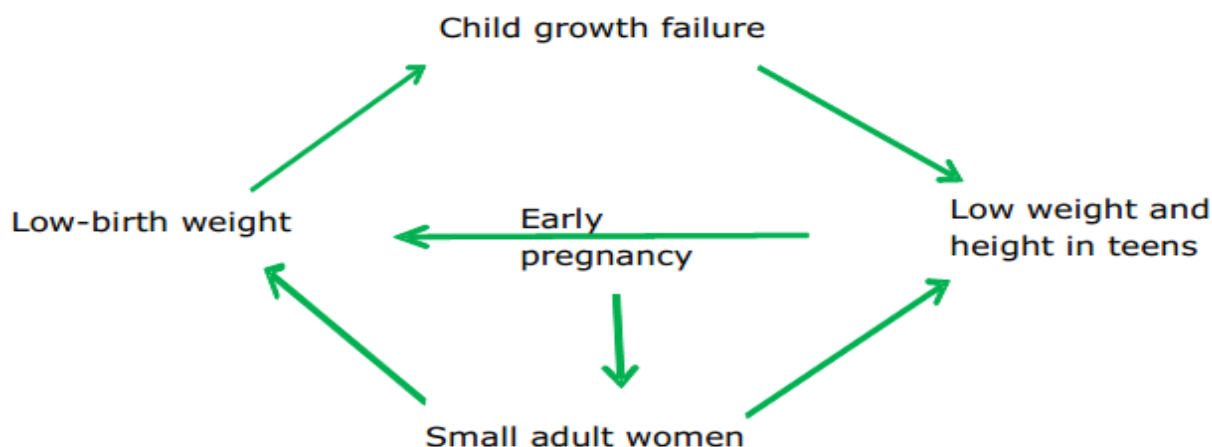
Source: UNSCN, 6th Report

3.1.3 The basic determinants

These are broad factors that act as catalysts and in themselves may not directly cause undernutrition. Basic determinants are mostly beyond the control of the individual.

3.1.3.1 Household level determinants

Education status of women: Educational status of women may have direct impacts on health outcomes of children as a more enlightened mother stands a better chance of utilizing and understanding health messages and putting them to practice (Frimpong and Pongou, no date; Ruel & Alderman et al., 2013; Sanawar et al., 2005). Education of women may also lead to high paying jobs for women. Women (45.7%) are at a disadvantage compared with men (61.8%) in terms of continuing education up to and beyond secondary education in Ghana (UNDP, 2013).

Occupational status of women: Household *food security* is likely to improve when women are gainfully employed. However, 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 determinant in health and nutrition outcomes (Frimpong and Pongou, no date; Srivastava et al., 2012; Van de Poel et al., 2007). 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).

3.1.3.2   Inadequate social amenities

In most developing countries amenities for water and sanitation are not nutrition sensitive (Gillespie et al., 2013). There is a wide gap between need and supply (UNICEF, 2013). People mostly get their water from polluted sources thus family hygiene and sanitation is affected and this may lead to infections and in the case of children resulting in loss of appetite hence leaving them vulnerable to undernutrition. Also, sanitation and drainage facilities are not covered and constructed in the middle of clustered settlements often resulting in the outbreaks of diseases (Save the Children, 2009, 2012a, 2012b; UNICEF, 2009).

In Ghana women (64%) are responsible for ensuring there is water available for the family and it takes averagely thirty minutes to make a round trip to fetch water. A staggering ninety-one percent (91%) of families use untreated water domestically. Open defecation is a common practice in Ghana (23%) and this is more pronounced in the rural areas where thirty-five percent (35%) of households do not own a toilet. Only a mere fifteen percent (15%) of Ghanaian households have access to improved sanitary facilities (MICS, 2011).

3.1.3.3   Sociocultural, economic and political determinants

Sociocultural: Social norms (such as early marriage and food taboos) may undermine the nutritional status of children (Ghartey, 2010; Save the Children, 2012a, 2012b; UNICEF, 2009; UNSCN, 6th Report). In the African context, marriage and the extended family are regarded as very important institutions. Household food security may be improved in families with strong marriage and extended family ties. There is also sharing of experiences on appropriate child care and feeding practices. The presence of an income earner (the husband) may result in more food resources. Solidarity within the extended family may also result in more food resources for the less privileged family members (Save the Children, 2009, 2012a; Srivastava et al., 2012). However, early marriages are likely to result in early child births increasing the risk of LBW (Bhutta et al., 2013; Save the Children, 2009, 2012a; UNICEF, 2013; UNSCN, 6th report). Also, a family of many people especially in poor households may lead to suboptimum feeding of children (Srivastava et al., 2012). Early marriage is widespread in Ghana. It is estimated that by age fifteen years, six percent (6%) of girls in Ghana are already married and by age eighteen years, twenty-seven percent (27%)

of teenage girls are already in some form of a union resulting in the high adolescent birth rates and LBW as previously mentioned (MICS, 2011).

Economic: Economic growth is expected to in the long run lead to good nutrition, however, if unchecked may lead to less food production, deepen existing inequities of wealth and income thereby exacerbating undernutrition (Save the Children, 2012a, 2012b; UNICEF, 2009). As witnessed in the developed world in 2007, economic growth in the long run may lead to economic crisis which lead to rising food prices (Ruel & Alderman et al., 2013; Save the Children, 2009; UNSCN, 6th Report). Of the seventy-five percent (75%) of Ghanaian households affected by rising domestic inflation, eighty-three (83%) cited resorting to coping mechanisms due to increased food prices (NDPC, 2010).

Political: There is generally a lack of political commitment towards nutrition in SSA. Sadly this lack of commitment has been translated down to health service administrators and workers. In developing countries, nutrition interventions are inadequately funded and often integrated into health and agriculture sector programmes, thus the focus on nutrition is usually lost during implementation (Gillespie et al., 2013; Ghartey, 2010).

Despite the GoG increasing its funding for nutrition (4.5% of the total disease care budget) since 2007 it is still inadequately funded compared to diseases such as malaria (12%) (Bahwere et al., 2011). The inability of the government to yet implement an operational national nutrition policy has been one of the stand-out weaknesses in the country's response (Ghartey, 2010). Furthermore, a huge chunk of the GoG's funding is not directly channeled to the nutrition units/programmes because nutrition programmes are integrated in other disease programmes (Ghartey, 2010). The running of separate nutrition programmes by the MOH and GHS is further attestation of the somehow disjointed implementation of nutrition interventions in Ghana. Political efforts and direction on nutrition in Ghana has always been towards the agriculture sector (Bahwere et al., 2011; Ghartey, 2010).

3.1.4 Agricultural factors

Agriculture is directly linked to food security. In developing country contexts where subsistence farming is the main agricultural activity, production is mainly staple crops and on small scale (Ruel & Alderman et al., 2013; Save the Children, 2009; UNDP, 2012; UNSCN, 6th Report). Production is usually not enough to last until the next harvest season. In the period leading to

harvest, there are food shortages resulting in starvation for poor families; and children become easily wasted (Save the Children, 2009; UNDP, 2012). A significant proportion of Ghanaians are food insecure during this period. It is estimated that for three to four months annually, poor families in Ghana are food insecure and up to six to eight months in an unstable farming year (NDPC, 2010).

3.1.5 Environmental factors

Seasonal variations, droughts or floods leave women and children prone to infections as such events are accompanied by parasite, and insect infestations and water, and sanitation problems. During such periods access to food is often difficult for the vulnerable and families may resort to coping strategies (Save the Children, 2009, 2012b; UNSCN, 6th Report). For instance prevalence of all the three types of undernutrition in Ghana is highest in the northern sector of the country (GSS, GHS & ICF MACRO, 2015). This is because 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 et al., 2007).

4   Chapter 4: Quantitative analysis

This chapter presents an analysis of the data from the nutrition survey carried out in 2011 by KSD. Simple percentages are used to determine undernutrition prevalence and frequency of predicted variables. A bivariate analysis is conducted to determine relationships between stunting and wasting and intermediate level variables. A multivariate logistic regression is performed to determine which variables are important predictors of stunting and wasting in children in the district.

4.1 Selection of variables

Table 3 illustrates the variables selected from the available dataset based on the literature review conducted and which were used for further statistical analysis.

Table 3: Variables of analysis

Literature Review	Variables
Description of study population	
Ethnicity	▪ Ewe, Mossi, Ada and Kwahu
Childs age	▪ 6-11, 12-23, 24-35 and 36 and above months
Childs sex	▪ Female and Male
Birth order	▪ 1-3rd, 4-6th, 7-9th born
Immediate determinants	
Infections	▪ Malaria, Diarrhoea, ARI, Skin Infections and others
Feeding practices	▪ Breast feeding and Complementary feeding
Underlying determinants	
Access to health services (Insurance status of child)	▪ Yes and No
Health seeking behaviour	▪ Health center/CHPS, Drug store, Herbalist and Hospital
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 determinants	
Mothers education	▪ Illiterate, Primary school level and Junior High School (JHS), and Senior High School (SHS)
Mothers occupation	▪ Trading, Farming, Public sector and Unemployed
Mothers marital status	▪ Married, Not-married, Divorced and Widowed

4.2 Findings

4.2.1 Characteristics of study population

4.2.1.1 Socio-demographic characteristics of children

As to be expected, the Kwahus being the indigents of the district account for 67% of the study participants. The age distribution shows most children were between 24 – 35 months old (31.6%). Most of the children were born

in the 1st – 3rd birth order (69.7%) and an even distribution between the sexes as detailed in Table 4.

Table 4: Socio-demographic characteristics of children

		Count	Percent
Ethnicity	Kwahu	208	67.1%
	Ewe	59	19.0%
	Mossi	20	6.5%
	Ada	4	1.3%
	Others	19	6.1%
	Total	310	100.0%
Child's Age (Months)	6 - 11 Months	52	16.8%
	12 - 23 Months	88	28.4%
	24 - 35 Months	98	31.6%
	36 Months and Above	72	23.2%
	Total	310	100.0%
Sex of Child	Male	155	50.0%
	Female	155	50.0%
	Total	310	100.0%
Birth Order	1 - 3rd Born	216	69.7%
	4 - 6th Born	74	23.9%
	7 - 9th Born	20	6.5%
	Total	310	100.0%

4.2.1.2 Prevalence of stunting and wasting

Majority of the children were well nourished. However, 22.3% were stunted and 19.0% wasted. Detailed results are shown in Table 5 and Figure 7 respectively.

Table 5: Prevalence of stunting and wasting

	Status	Frequency	Percent
Stunted	Normal	241	77.7%
	Stunted	37	11.9%
	Severely Stunted	32	10.3%
	Total	310	100.0%
Wasted	Normal	251	81.0%
	Wasted	38	12.3%
	Severely Wasted	21	6.7%
	Total	310	100.0%

Figure 7: Prevalence of stunting and wasting
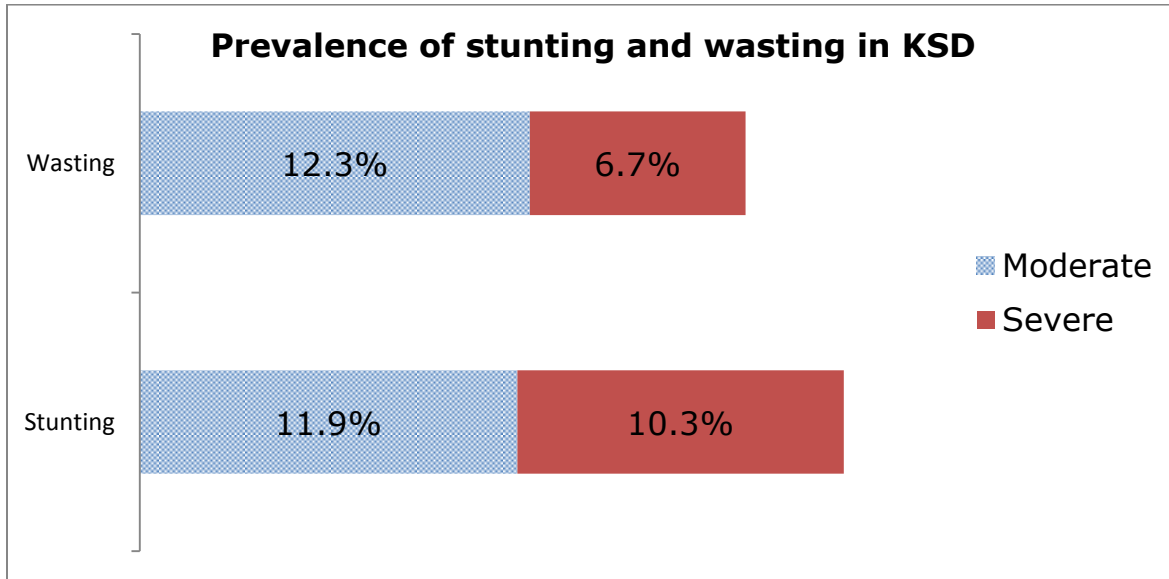
4.2.2 Immediate determinants

4.2.2.1   Feeding practices
Survey respondents were questioned about how they fed their children. Most children in age range 12-23 months (51.8%) were still breastfed. The results show 63.2% of children had been weaned. Overall, 88.7% of children were being fed complementary foods as shown in Table 6 below.

Table 6: Child feeding practices

Child still Breast Feeding		Yes		No	
		Count	**Column N %**	**Count**	**Column N %**
Child's Age(Months)	6 - 11 Months	51	44.70%	1	0.50%
	12 - 23 Months	59	51.80%	29	14.80%
	24 - 35 Months	4	3.50%	94	48.00%
	36 Months and Above	0	0.00%	72	36.70%
	Total	114	100.00%	196	100.00%
Complementary Breastfeeding		**Yes**		**No**	
		Count	**Column N %**	**Count**	**Column N %**
Child's Age(Months)	6 - 11 Months	38	13.80%	14	40.00%
	12 - 23 Months	75	27.30%	13	37.10%
	24 - 35 Months	96	34.90%	2	5.70%
	36 Months and Above	66	24.00%	6	17.10%
	Total	275	100.00%	35	100.00%

4.2.2.2   Common childhood illnesses

Table 7 pertains to the common illness that the children had suffered two weeks prior to the study. Overall, 23.50% of the participants indicated their children had suffered from malaria; this is followed by skin infections (19.40%). However, it should be noted that these responses collected were subjective because they are based on a mother's account or perception of the illnesses without validation by medical records.

Table 7: Common childhood illnesses

	Malaria	Yes		No	
		Count	Column N %	Count	Column N %
Child's Age(Months)	6 - 11 Months	12	16.40%	40	16.90%
	12 - 23 Months	18	24.70%	70	29.50%
	24 - 35 Months	27	37.00%	71	30.00%
	36 Months and Above	16	21.90%	56	23.60%
	Total	73	100.00%	237	100.00%
	Diarrhoea	Yes		No	
		Count	Column N %	Count	Column N %
Child's Age(Months)	6 - 11 Months	7	13.50%	45	17.40%
	12 - 23 Months	18	34.60%	70	27.10%
	24 - 35 Months	21	40.40%	77	29.80%
	36 Months and Above	6	11.50%	66	25.60%
	Total	52	100.00%	258	100.00%
	ARI	Yes		No	
		Count	Column N %	Count	Column N %
Child's Age(Months)	6 - 11 Months	6	11.30%	46	17.90%
	12 - 23 Months	15	28.30%	73	28.40%
	24 - 35 Months	18	34.00%	80	31.10%
	36 Months and Above	14	26.40%	58	22.60%
	Total	53	100.00%	257	100.00%
	Skin Infections	Yes		No	
		Count	Column N %	Count	Column N %
Child's Age(Months)	6 - 11 Months	14	23.30%	38	15.20%
	12 - 23 Months	16	26.70%	72	28.80%
	24 - 35 Months	17	28.30%	81	32.40%
	36 Months and Above	13	21.70%	59	23.60%
	Total	60	100.00%	250	100.00%

4.2.3 Underlying determinants

4.2.3.1   Access to health services
As detailed in Table 8, forty-two percent (42.3%) of children were not registered under the NHIS or any other health insurance scheme.

Table 8: Access to health services

		Count	Percent
Insurance status of child	No	179	57.7%
	Yes	131	42.3%
	Total	310	100.0%

4.2.3.2   Health seeking behaviour
The results show out of the 310 mothers interviewed, 68.1% take their children for CWC sessions as shown in Table 9.

Table 9: Health background of children

		Count	Percent
Does Child Attend CWC	No	99	31.9%
	Yes	211	68.1%
	Total	310	100.0%

4.2.3.3   Mothers age
More than half (56.8%) of the mothers that participated in the survey were below thirty years as shown in Table 10.

Table 10: Mothers age

		Count	Percent
Mothers age	Below 30 years	176	56.8%
	30 years and above	134	43.2%
	Total	310	100.0%

4.2.3.4   Mothers' nutritional status
Figure 8 pertains to the nutritional status of the mothers that participated in the survey. Most of the mothers (62.6%) had normal BMI (BMI 18.5 – 24.99). However, 21.3% of them were overweight (BMI > 25).

Figure 8: Mothers nutrition background

BMI of Mothers

	Normal (BMI 18.5 - 24.99)	Underweight (BMI<18.5)	Overweight (BMI>25)	Obese (BMI>30)
Series1	62.6	5.8	21.3	10.3
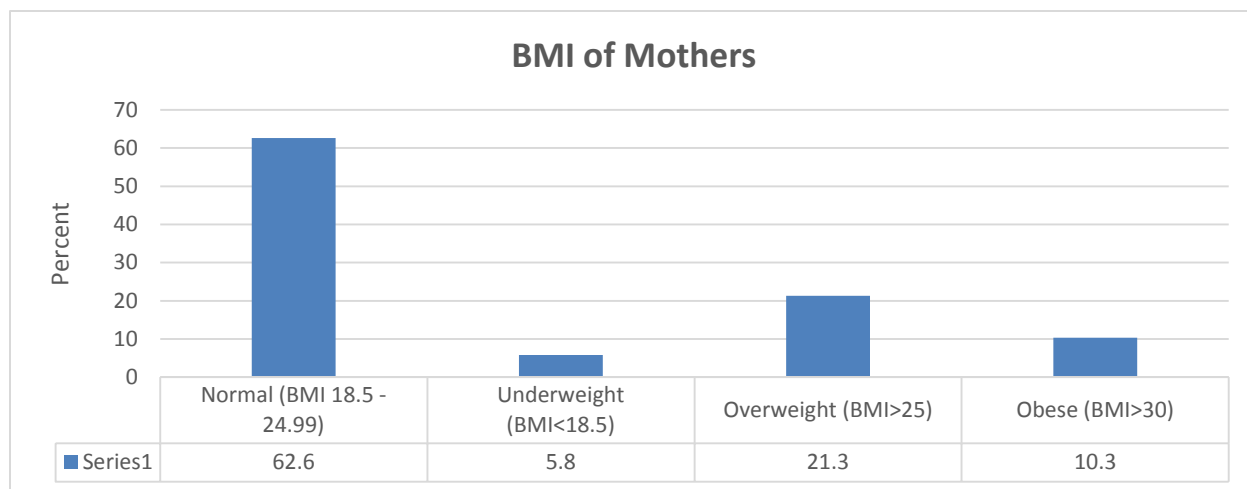
4.2.4 Basic determinants

4.2.4.1 Educational status of mothers

Most of the mothers were literate with fifty-seven percent (57.4%) haven been educated up to the Junior High School and Senior High School levels as shown in Table 11.

Table 11: Educational status of mothers

		Count	Percent
Mothers education status	Illiterate	54	17.4%
	Primary School Level	78	25.2%
	Junior High School (JHS) and Senior High School (SHS)	178	57.4%

4.2.4.2 Occupational status of mothers

As detailed in Table 12, trading (51%) was the main occupation of the mothers and followed by farming (30.3%)

Table 12: Occupational status of mothers

		Frequency	Percent
Mothers Occupation	Trading	158	51.0%
	Farming	94	30.3%
	Public Sector	6	1.9%
	Unemployed	52	16.8%
	Total	310	100.0%

4.2.4.3 Marital status of mothers

Table 13 pertains to the marital status of the mothers that participated in the survey. Seventy six percent (76.1%) of mothers were married and 15.2% were single.

Table 13: Marital status of mothers

		Count	Percent
Marital status	Married	236	76.1%
	Single	47	15.2%
	Divorced	20	6.5%
	Widowed	7	2.3%
	Total	310	100.0%

4.2.5 Multivariate regression: Determinants of stunting and wasting in children 6-59 months in KSD.

After adjusting for confounding, the results of a logistic regression are presented in Tables 14 and 15.

4.2.5.1 Stunting

Table 14 shows detailed results from an adjusted logistic regression of determinants of stunting in children. This study reveals stunting is linearly correlated with age in KSD; older children from 12-23 months were twice (OR=2.32, 95%CI 0.76 – 6.92, p=0.05) more likely to be stunted compared with children 6-11 months old. Furthermore, children 24-35 months old were four times (OR=4.428, 95%CI 1–18.4, p=0.050) more likely to be stunted compared with children 6-11 months old and statistically significant. Additionally, children 36 months old and above were thrice (OR=2.92, 95%CI 0.61-14.05, p=0.05) more likely to be stunted compared with 6-11 month olds.

Family size was significantly associated with stunting. Children in the 4th-6th birth category were less likely (OR=0.25, 95%CI 0.1-0.63, p=0.004) to be stunted than children in the 1st-3rd birth category.

A bivariate analysis as presented in Appendix Table A2 showed diarrhea was significantly associated with stunting (Chi Square= 22.75, p-value=0.047 alpha level=0.05). Children who suffered from diarrhea (OR=1.72, 95%CI 0.76-3.91, p=0.05) and skin infections (OR=1.98, 95%CI 0.92-4.25,

p=0.05) were about twice more likely to be stunted compared with children who did not contract these illnesses.

Children that were still breastfed were about twice (OR=1.83, 95%CI 0.58-5.77, p=0.05) more likely to be stunted compared with children that had been weaned.

Furthermore, insuring a child's health was found to be a protective factor against stunting and significantly associated. Children with health insurance were less likely (OR=0.44, 95%CI 0.21-0.89, p=0.022) to be stunted compared with children without insurance; the reverse is true, thus emphasizing the importance of insuring a child's health.

Children taken to a Health Center/CHPS compound when ill were twice more likely (OR=2.2, 95%CI 0.88-5.49, p=0.05) to be stunted compared with children taken to the hospital.

The results further reveal that children whose mothers' first choice of healthcare provider was a herbalist were about fourteen times more likely (OR=14.3, 95%CI 1.29-158.04, p=0.030) to be stunted compared with children that were taken to the hospital for treatment and significantly associated.

Children whose mothers were overweight were about twice (OR=1.78, 95%CI 0.8-4, p=0.05) more likely to be stunted compared with children whose mothers had normal weight.

A mother being obese was a protective factor against stunting and significantly associated. Children of mothers who were obese were less likely (OR=0.2, 95%CI 0.4-0.97, p=0.046) to be stunted compared with children whose mothers were of normal weight.

Children whose mothers were farmers were less likely (OR=0.4, 95%CI 0.17-0.93, p=0.033) to be stunted compared with children whose mothers were traders and statistically significant.

Furthermore, children of mothers who worked in the public sector were about nine times (OR 8.8 95%CI 1.05-74.16, p=0.044) more likely to be stunted as compared with children whose mothers occupation is trading and significantly associated.

The likelihood of stunting in children was significantly independently associated with divorced mothers, thus a divorced mother was almost five times (OR 4.5 95%CI 1.29-15.71, p=0.018) more likely to have a stunted child compared with married mothers.

Table 14: Determinants of stunting

Logistic regression		Number of observation = 290		
Log likelihood = -130.85536		LR chi2(31) = 56.53 Prob > chi2 = 0.0034 Pseudo R2 = 0.1776		
	Odds ratio	**(95% Conf. Interval)**		**P>|z|**
Description of study population				
Ethnicity				
Kwahu	1			
Ewe	0.64	0.25	1.62	0.340
Mossi	1.03	0.25	4.34	0.964
Ada	1.67	0.079	35.24	0.743
Childs age (In months)				
6-11	1			
12-23	2.32	0.76	6.92	0.132
24-35	***4.428***	***1***	***18.4***	***0.050***
36 and above	2.92	0.61	14.05	0.180
Child sex				
Male	1			
Female	0.56	0.29	1.09	0.089
Birth Order				
1-3rd born	1			
4-6th born	***0.25***	***0.1***	***0.63***	***0.004***
Immediate determinants				
Infections				
Malaria				
No	1			
Yes	1.17	0.55	2.49	0.680
Diarrhoea				
No	1			
Yes	1.72	0.76	3.91	0.194
Acute Respiratory Infections				
No	1			
Yes	1.3	0.56	2.1	0.538
Skin Infections				
No	1			
Yes	1.98	0.92	4.25	0.079

Table 13 Cont. Determinants of stunting

	Odds ratio	(95% Conf. Interval)		P>|z|
Feeding practices				
Child still Breastfeeding				
No	1			
Yes	1.83	0.58	5.77	0.305
Complementary feeding				
No	1			
Yes	1.49	0.47	4.67	0.498
Underlying determinants				
Insurance status of child				
No	1			
Yes	***0.44***	***0.21***	***0.89***	***0.022***
Health seeking behavior (where do you take child when ill?)				
Hospital	1			
Health center/CHPS	2.2	0.88	5.49	0.090
Drug Store	1.36	0.08	23.01	0.830
Herbalist	***14.3***	***1.29***	***158.04***	***0.030***
Mothers age				
Below 30 years	1			
30 years and above	0.96	0.45	2.7	0.925
Mothers nutritional status				
Normal weight	1			
Underweight	1.35	0.34	5.28	0.667
Overweight	1.78	0.8	4	0.160
Obese	***0.2***	***0.4***	***0.97***	***0.046***
Basic determinants				
Mothers educational status				
Illiterate	1			
Primary school level	0.67	0.23	1.96	0.465
Junior high school and above	0.71	0.25	1.98	0.508
Mothers Occupation				
Trading	1			
Farming	***0.4***	***0.17***	***0.93***	***0.033***
Public sector	***8.82***	***1.05***	***74.16***	***0.044***
Unemployed	0.43	0.17	1.08	0.072
Mothers marital status				
Married	1			
Single	0.92	0.38	2.23	0.853
Divorced	4.5	1.29	15.71	0.018
Widowed	1.47	0.21	10.49	0.698

4.2.5.2   Wasting

As detailed in Table 15 and Appendix Table A2, the results reveal that none of the selected determinants were statistically significantly associated with wasting in children in both multivariate logistic and bivariate regression (Chi-square value= 30.62, p-value = 0.5364, α = 0.05).

However, wasting was about twice higher (OR=1.92, 95%CI 0.8-4.61, p=0.05) in children taken to the Health Center/CHPS compared with those taken to the hospital for treatment when ill. Furthermore, wasting was about thrice (OR=2.96, 95%CI 0.22-40.78, p=0.05) more likely in children taken to the drug store for treatment when ill compared with those taken to the hospital. Additionally, wasting was about seven times (OR=6.94, 95%CI 0.76-63.73, p=0.05) more likely in children whose mothers took them to a herbalist when ill compared with those that were taken to the hospital for treatment.

The findings also show that wasting was about six times (OR=5.76, 95%CI 0.84-39.36, p=0.05) higher in infants whose mothers' occupation was in the public sector compared with those whose mothers were traders.

The likelihood of wasting was about twice (OR=1.54, 95%CI 0.47-5.09, p=0.05) more likely in children with divorced parents compared with children whose parents were still married.

Table 15: Determinants of wasting

Logistic regression:		Number of observations = 310		
		LR chi2(32) = 30.62		
		Prob > chi2 = 0.5364		
Log likelihood = -135.56419		Pseudo R2 = 0.1015		
	Odds ratio	**95% Conf. Inetrval**		**P>|z|**
Description of study population				
Ethnicity				
Kwahu	1			
Ewe	0.41	0.16	1.04	0.061
Mossi	0.21	0.04	1.23	0.083
Ada	0.93	0.07	12.58	0.956
Childs age (In months)				
6-11	1			
12-23	1.05	0.36	3.08	0.923
24-35	0.87	0.21	3.67	0.854
36 and above	0.72	0.16	3.32	0.672
Child sex				
Male	1			
Female	0.77	0.41	1.46	0.427
Birth Order				
1-3rd born	1			
4-6th born	0.79	0.35	1.78	0.564
7-9th born	0.38	0.07	2.13	0.27
Immediate determinants				
Infections				
Malaria				
No	1			
Yes	1.23	0.58	2.59	0.591
Diarrhoea				
No	1			
Yes	1.23	0.51	2.94	0.65
Skin infections				
No	1			
Yes	1.47	0.68	3.16	0.323

Table 15 Cont: Determinants of wasting

	Odds ratio	95% Conf. Inetrval		P>|z|
Feeding practices				
Child still breastfeeding				
No	1			
Yes	0.59	0.19	0.91	0.384
Complementary feeding				
No	1			
Yes	0.8	0.27	2.43	0.699
Underlying determinants				
Insurance status of child				
No	1			
Yes	0.7	0.35	1.38	0.299
Health seeking behavior (where do you take child when ill?)				
Hospital	1			
Health center/CHPS	1.92	0.8	4.61	0.143
Drug Store	2.96	0.22	40.78	0.417
Herbalist	6.94	0.76	63.73	0.087
Mothers age				
Below 30 years	1			
30 years and above	1.24	0.58	2.66	0.577
Mothers nutritional status				
Normal weight	1			
Underweight	1.23	0.3	5.06	0.77
Overweight	1.32	0.6	2.94	0.493
Obese	0.73	0.23	2.32	0.598
Basic determinants				
Mothers educational status				
Illiterate	1			
Primary school level	0.46	0.02	1.05	0.065
Junior High School and above	0.63	0.25	1.57	0.316
Mothers Occupation				
Trading	1			
Farming	0.46	0.2	1.04	0.065
Public sector	5.76	0.84	39.36	0.074
Unemployed	0.62	0.25	1.57	0.316
Marital status				
Married	1			
Single	0.36	0.12	1.09	0.071
Divorced	1.54	0.47	5.09	0.476
Widowed	0.39	0.04	4.01	0.429

5   Chapter 5: Discussion

5.1 Nutrition status of children <5 in KSD

The persistence of PEM among children and women particularly in rural areas and undeveloped districts is clearly an indictment on Ghana's achievement of MDG 1 (GHS, 2013). The prevalence of stunting and wasting in the Kwahu area as reported by this study are 22.3% and 19% respectively. These findings in the Kwahu area are just a confirmation of the wide geographical disparities (substantial differences in regional, urban and rural) in the prevalence of undernutrition in Ghana and that within a defined geographical setup, prevalence of stunting and wasting is bound to vary from one location to another (Anderson et al., 2010; GSS, GHS & ICF MACRO, 2015; Van de Poel et al., 2007). These differences in geographical prevalence of stunting and wasting in a country may be due the effects of variations in environmental and cultural factors (Medhin et al., 2010; Sanawar et al., 2005; Van de Poel et al., 2007).

Stunting as determined by this study is linearly correlated with age. This is attributable to the fact that stunting is a chronic condition hence as children grow older the combined effects of low food intake and diseases become visible over time (Kabubo-Mariara et al., 2006; Olanrewaju, Iyabo & Bamidele, 2011; Van de Poel et al., 2007). Growth monitoring and promotion is the key strategy to tackling stunting in Ghana (GHS, 2013; MICS, 2011). In KSD, these sessions are conducted at CWCs on monthly basis and Child Health Weeks (conducted biannually). Activities adopted by the District Health Management Team (DHMT) as part of these sessions include; the Baby Friendly Initiative to make the growth monitoring and promotion sessions more appealing to caregivers and food demonstration at selected health facilities. Child tracing at the CHPS compound level has also been implemented - Community Health Officers (CHOs) are required to trace the whereabouts of children (with emphasis on children below two years) that have missed three consecutive child weighing sessions (KSDHA, 2011, 2014).

However, though commendable, this strategy is deficient in that children above two years are not accorded equal emphasis and priority. This group of children is of school going age hence mostly unavailable to partake in this growth monitoring sessions (probably partly responsible for the 68.1% of children taken to CWCs in this study). In general, not only in KSD, nutrition programmes in Ghana tend to be less responsive to the nutrition needs of older children. For instance the health system's target for micronutrient supplementation is mostly infants and very young children. This therefore makes targeting of children in the school going age category important. Preventive nutrition services could be delivered to this group of children through school health programmes. Integration of growth monitoring and

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screening into the existing School Health Education and Deworming Programmes implemented at the basic and primary school levels will extend coverage of this critical intervention to this group of children (Ghartey, 2010; GHS, 2013). Furthermore, a Community Based Surveillance System if put in place entailing active case search for stunted (as well as wasted) children using the already trained Community Health Volunteers will ensure quick identification of cases for action and also further help endorse growth monitoring and promotion in the communities.

The high prevalence of wasting in KSD is attributable to food insecurity given that feeding practices and infections were not significantly associated with wasting in neither logistic regression nor bivariate analysis. The KSDHA survey was conducted in August, usually the peak of the lean season in Ghana. Therefore the effects of food shortages in the district could have led to this high prevalence of wasting in children. As the KSD Nutrition Officer put it "am not surprised at this finding on the high prevalence of wasting. At this time of the year I see lean children in most of the communities when I go for monitoring. In the children's ward here at the district hospital you will find a lot of wasted children. The problem is that the food available is used as seed during the planting season and the poor families are unable to travel to the bigger markets to purchase food and it is the children that suffer most at this time of the year. Come back in mid-October and you will see some of the children have started to fill up." This finding is consistent with earlier reports that in Ghana there is food scarcity during the lean season resulting in rising food prices (FOA, 2009; NDPC, 2010; Van de Poel et al., 2007). A supplementary feeding programme is the short term answer to this problem. However, considering the inadequate resources available to the Nutrition Unit of the KSDHA, unfortunately, there is not much that can be done by the health administration to remedy these perineal food shortages. Though, with this report, the KSDHA has a case to partner the Department of Ministry of Food and Agriculture to intensify advocacy and lobbying especially among donor agencies and civil society organizations for the introduction of supplementary and therapeutic feeding programmes for children in the district.

5.2 Stunting

Access to healthcare services as an important predictor of undernutrition is demonstrated in the significant association between health insurance and stunting in this study. This therefore underscores the importance of registering children on the District Health Insurance Scheme (DHIS). Registration with the NHIS ensures that registered individuals can seek healthcare at any of the GHS facilities. An insured child is therefore more likely to be sent to a health facility to seek prompt and proper medical attention than a non-insured child. Mothers may then be in the position of

gaining some information and education on feeding practices for their children, growth faltering may then be spotted and possibly remedied (Frimpong and Ponguo, no date; Reyes et al., 2004). However, due to financial incapability of parents (57.7% of children in the survey were not registered on the NHIS) and systemic challenges within the NHIS (challenges relating to registration, and premium payment and the long waiting time before accessing healthcare after registration), many children are denied essential healthcare which could have helped improve their nutrition (GHS, 2013; NDPC, 2010). The only collaboration between the KSDHA and the DHIS is in the training of health workers on claims reimbursement. There are however opportunities for further collaboration; the KSDHA can propose children to or work with the DHIS in identifying needy children for registration under the exemptions category provided for by the NHIS Act. They are also opportunities for joint outreach and IEC activities on health promotion with inclusion of nutrition related topics.

Eighteen government health facilities serving 226 communities are definitely not enough to meet the health needs of residents in the district. Average travel distance to a health facility in the district is thirty minutes by vehicle (KSDHA, 2014) - possibly explaining the moderate attendance (68.1% of children) at CWCs. This is further exacerbated by the lack of established private health facilities in the district to complement health service delivery. This has negative implications on population health and corroborated by the significant association between seeking treatment from a herbalist and stunting. This consequently leads to late presentation of cases at the health facilities resulting in adverse health outcomes. The choice of the herbalist as a healthcare provider is also partly as a result of social norms and financial inaccessibility (further lending credence to the finding on health insurance as a protective factor against stunting) (Ghartey, 2010; Frimpong and Ponguo, no date; Reyes et al., 2004). To counteract this poor geographical inaccessibility, a shift in strategy from less of facility based to more of mobile healthcare delivery will improve coverage of essential curative child health and preventive nutrition services. Inclusion of Out-Patient Services in routine outreach programmes will increase the availability of essential and comprehensive nutrition and health services to children (Ghartey, 2010; GHS, 2013).

Delivery strategies have been identified as an important facet in nutrition programming and have been advocated for by the Maternal and Child Study Group on Nutrition (Bryce et al., 2013; Gillespie et al., 2013; Ruel & Alderman et al., 2013). Regarding the Kwahu area, from this study though no statistical significance was established, forty-three percent (43%) of mothers had little or no education at all and this has adverse consequences on the health of their children. In Ghana, most health education materials are usually written in english. Child health record cards that contain the

most basic of information and education for mothers to cater for their children are written in english. This implies that mothers with little or no education have limited access to key messages on appropriate foods, feeding and caring practices for their children. Those who are able to read may not even actually understand what they are reading. Even routine healthcare delivery at CWCs and IEC activities are also mainly conducted in english (Ghartey, 2010; GHS, 2013; Frimpong and Ponguo, no date). Innovations such as using video messages and pictures during CWCs and IEC activities will help communicate messages better. Furthermore, focused nutrition counselling for caregivers whereby messages on child feeding and caring practices are tailored to meet specific child needs will help speed up understanding and their adoption (Bahwere et al. 2011; Ghartey, 2010; GHS, 2013).

Varied relations have been found between maternal occupation and the nutritional status of children. As a mother's occupational status improves, she needs more time to attend to her work thereby reducing the amount of time spent on the care of her child. Mothers who have regular (formal) work are more likely to wean their children earlier than those that are unemployed or working in the informal sector (Ene-Obong et al., 2010; Srivastava et al., 2012; Vyas et al., 2010) as corroborated by the findings on women working in the public sector as a determinant of child stunting in KSD. The significance of the variable on women farmers as a protective factor against child stunting is therefore suggestive of early weaning and poor feeding and caring practices adopted by women with formal jobs in the district. Mother-to-mother support groups as a strategy can be used by the KSDHA as a targeted intervention to disseminate growth monitoring and health promotion information, while at the same time facilitating experience sharing and fostering solidarity. This will help in promoting the positives and mitigate the negative effects of maternal occupation on children's nutrition. Through this medium, working mothers can then be; counselled on child nutrition and appropriate breast milk substitutes; and taught how to express, and store breast milk and how to practice responsive feeding for their children (Bahwere et al. 2011; Ghartey, 2010; GHS, 2013).

Stunting in children in the Kwahu area was significantly associated with participants whose marital status was divorce. This is consistent with a study by Katepa-Bwalya et al. where the father of the child was identified as being the main source of financial and moral support pertaining to infant feeding (Katepa-Bwalya et al., 2014). Stunting and wasting are indicators of chronic and acute undernutrition respectively which can be directly attributed to inadequate food intake as well as diseases (Black et al., 2008, 2013; Save the Children, 2009; UNICEF, 2013; UNSCN, 6th Report). Given that the recent history of disease was not significantly associated with wasting, this is therefore suggestive that hunger is rife in children of single mothers in the

district. This is corroborated by the significance of the variable on health insurance; if a woman is married she has the support to register with the NHIS and this therefore means that she has a greater chance of having children who receive adequate medical and nutrition care hence have a reduced risk of falling into chronic and acute undernutrition. Targeting children of this group for growth monitoring and promotion and nutrition counselling for their mothers will help improve their nutrition. Prompt referral to the Holy Family Hospital in Kwahu West District for therapeutic feeding and rehabilitation support will help ameliorate the adverse effects of stunting suffered by these children.

5.3 Wasting

Though no significant associations were found between wasting and the variables of analysis in this study, the higher likelihood (twice more) of wasting in children that were taken to Health Center/CHPS for treatment is distressing and raises concern about the quality of services offered at these facilities. Effective interventions aimed at reducing undernutrition in children require both preventive and curative services especially for wasting (Black et al. 2008, 2013; Save the Children 2009; UNICEF 2013). Unfortunately, in KSD, the most important gap in nutrition programming is the absence of nutrition treatment and rehabilitation services. Forgoing, the introduction of curative and rehabilitative nutrition services in the district is imperative.

5.4 Limitations

This analysis is not without some limitations. Firstly, this study was conducted in only one district so therefore the findings are not generalized outside of the district. Further, data for a large of number of children was excluded from this analysis due to incomplete anthropometric records. The data collected by KSDHA that is used in this analysis has been a big limitation; notably missing was information on Infant and Young Child Feeding Practices and information on the wealth status of respondents. Lastly, interviewee bias may have occurred during the data collection, mothers may have provided socially desirable answers or information in relation to illnesses suffered by their children, health seeking behavior and feeding practices.

5.2 Conclusion

The causes of undernutrition are multiple. Ghana and for that matter KSD continues to grapple with undernutrition which remains a serious health and social canker.

Predictors of undernutrition in KSD as determined by this study are mainly underlying and basic determinants thereby limiting the capability of the health sector in addressing them comprehensively. This re-echoes the fact

that determinants of undernutrition are context specific, requiring multi-sectoral responses hence the need for evidence based decisions to tackling this plague. An inadequacy of essential health and nutrition sensitive amenities and infrastructure present a daunting challenge to nutrition programming in the district.

All too familiar, poor planning and design affects implementation of nutrition and healthcare interventions. Ironically, the design of these programmes is to the convenience of the health workers and health service rather than the clients. Opening, and closing times and lack of services during weekends have adverse effects on utilization especially of health promotion services.

Inadequate personnel, medicines and supplies in KSD have had adverse effects on health seeking behavior. The lack of essential supplementary, therapeutic and nutrition rehabilitation interventions in the district in view of the high prevalence of undernutrition especially that of wasting necessitate a call to action.

This study set out to determine factors responsible for undernutrition in children 6-59 months as well as to explore associations between these determining factors.

Based on the findings from the study, the following conclusions are drawn:

Prevalence of wasting and stunting among children 6-59months in KSD

Findings from the study placed the prevalence of stunting and wasting at 22.3% and 19% respectively. These figures however are influenced by child and maternal demographics.

Determinants of Undernutrition

Determinants of stunting as found in the study cuts across the underlying and basic categories of determinants. Child's age has been found to be a demographic determinant of stunting. Access to health services (insurance status) and health seeking behavior (Health Center/CHPS and herbalist as first point of call when a child is sick) are underlying determinants of stunting in children in KSD. Likewise, basic determinants of stunting in children as determined by this study include mothers' occupation (farming and mothers working in the public sector) and marital status (divorced).

However, none of the variables was significantly associated with wasting.

Association between nutritional status and determining factors

The associations between the nutritional status of the children and the determinants are divided into two categories, the positive determinants (nutritional status improves when these are improved) and the negative determinants (increasing these compromises the nutritional status of the child). Insurance status of the child and farming were found to be protective factors against stunting. However, the choice of healthcare provider (Health Center/CHPS and herbalist), mothers working in the public sector and a mother being divorced were found to have negative effects on the nutritional status of children.

In summary, this study has demonstrated that undernutrition is a public health problem in KSD and urgent action is required to address acute undernutrition in children.

Recommendations

Based on the findings, the following recommendations are made to the KSDHA.

Short-term interventions:

1. Targeting children of high-risk mother groups: interventions should be put in place to provide counselling, support and information related to child health and nutrition for uneducated, working and divorced mothers. Measures should also be put in place targeting older children to ensure their participation in CWCs and growth monitoring and promotion activities.

    KSDHA should facilitate the formation of mother-to-mother support groups in the district. KSDHA should also explore the possibility of including home visits in IEC and outreach programmes. These mediums will serve as platforms for enrolling targeted interventions.

2. KSDHA should extend CWCs to all health facilities in the district and work on increasing the frequency of these CWCs. Food demonstration should also be extended to all health facilities in the district and incorporated in CWCs.

KSDHA should work towards:

3. Intensify its lobbying at the regional and national GHS offices for the introduction of CMAM in the district.

4. Collaborating with district level stakeholders:

Engaging the District Office of the NHIS to ensure there are NHIS Focal Persons at the health facilities and to roll-out joint IEC programmes on health promotion and the Benefits Package under the insurance scheme.

Collaborate with the district Department of Ministry of Food and Agriculture to train Agric Extension Officers on Infant and Young Child Feeding Practices. Opportunities on providing mothers and farmers with information and education on good nutrition and food demonstration through joint IEC activities should be explored. The two departments should also embark on joint advocacy and lobbying among NGOs and the donor community for the introduction of a supplementary feeding programme for children in the district.

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Appendices
Appendix 1

Bivariate analysis of associations between undernutrition and immediate determinants of undernutrition in children 6-59 months in KSD

Table A1: Relationship between stunting and immediate determinants of undernutrition feeding practices in children in KSD

| | | Stunting | | | | | | |
| | | Stunted | | Normal | | Pearson Chi-Square Tests | | |
		Count	Column N %	Count	Column N %	Chi-square	df	Sig.
Child still Breast Feeding	No	46	66.70%	150	62.20%	0.452	1	0.501
	Yes	23	33.30%	91	37.80%			
	Total	69	100.00%	241	100.00%			
Complementary Breastfeeding	No	6	8.70%	29	12.00%	0.597	1	0.44
	Yes	63	91.30%	212	88.00%			
	Total	69	100.00%	241	100.00%			
Malaria	No	51	73.90%	186	77.20%	0.318	1	0.573
	Yes	18	26.10%	55	22.80%			
	Total	69	100.00%	241	100.00%			
Diarrhoea	No	52	75.40%	206	85.50%	3.931	1	0.047*
	Yes	17	24.60%	35	14.50%			
	Total	69	100.00%	241	100.00%			
Respiratory	No	56	81.20%	201	83.40%	0.19	1	0.663
	Yes	13	18.80%	40	16.60%			
	Total	69	100.00%	241	100.00%			
Skin Infections	No	51	73.90%	199	82.60%	2.577	1	0.108
	Yes	18	26.10%	42	17.40%			
	Total	69	100.00%	241	100.00%			

The Chi-square statistic is significant at the 0.05 level (there is a significant relation between a child with history of diarrhoea and Stunting)

Appendix 2

Table A2: Relationship between wasting and immediate determinants of undernutrition feeding practices in children in KSD

Wasting								
		Wasted		**Normal**		**Pearson Chi-Square Tests**		
		Count	**Column N %**	**Count**	**Column N %**	**Chi-square**	**df**	**Sig.**
Child still Breast Feeding	No	40	67.80%	156	62.20%	0.655	1	0.418
	Yes	19	32.20%	95	37.80%			
	Total	59	100.00%	251	100.00%			
Complementary Breastfeeding	No	6	10.20%	29	11.60%	0.091	1	0.762
	Yes	53	89.80%	222	88.40%			
	Total	59	100.00%	251	100.00%			
Malaria	No	44	74.60%	193	76.90%	0.142	1	0.706
	Yes	15	25.40%	58	23.10%			
	Total	59	100.00%	251	100.00%			
Diarrhoea	No	49	83.10%	209	83.30%	0.002	1	0.968
	Yes	10	16.90%	42	16.70%			
	Total	59	100.00%	251	100.00%			
Respiratory	No	54	91.50%	203	80.90%	3.822	1	0.051
	Yes	5	8.50%	48	19.10%			
	Total	59	100.00%	251	100.00%			
Skin Infections	No	45	76.30%	205	81.70%	0.893	1	0.345
	Yes	14	23.70%	46	18.30%			
	Total	59	100.00%	251	100.00%			