UNIVERSITY OF CAPE COAST

WOMEN EMPOWERMENT, NUTRITIONAL STATUS OF CHILDREN AND HOUSEHOLD FOOD SECURITY IN GHANA

GLORIA ESSILFIE

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BY

GLORIA ESSILFIE

Thesis submitted to the Department of Economic Studies of the School of Economics, College of Humanities and Legal Studies, University of Cape Coast, in partial fulfilment of the requirements for the award of Doctor of Philosophy Degree in Economics

AUGUST 2020

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research work and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature…… Date……

Name: Gloria Essilfie

Supervisors' Declaration

We hereby declare that the preparation and presentation of this thesis were supervised in accordance with the guidelines on supervision of thesis as laid down by the University of Cape Coast.

Principal Supervisor's Signature……. Date……..

Name: Prof. Samuel Kobina Annim

Co-supervisor's Signature……... Date…….……

Name: Dr Emmanuel Ekow Asmah

ABSTRACT

This thesis investigates whether women's empowerment, measured by education attainment relative to her partner, decision-making and acceptance of domestic violence, is related to nutritional status of children and household food security in Ghana. Using data from 2014 Ghana Demographic and Health Survey, Ghana Living Standard Survey, 2017 and Feed the Future 2012 and 2015, the study examines the effect of women empowerment on child's nutritional status at different points in its conditional distributions using Quantile Regression estimation technique. Generalized Ordered Logit and margins are used to estimate the probability of a household being food secure as women empowerment increases, whereas Random Effect, Generalized Estimating Equations and Multivariate decomposition are used to examine the probability of female-headed households being food secure as women empowerment increases. The study observes that women's empowerment is associated with improvement in the nutritional status of children with Z-scores less than -4 and -3 standard deviations, for acutely and severely malnourished childre, respectively. Variation in food insecurity between the gendered household types is as a result of differences in explained and unexplained characteristics. However, improvement in women empowerment, proxied by decision-making and relative education reduces food insecurity in female-headed households by 45 and 9 percent respectively. The study recommends that the Ministry for Gender and Social Protection should educate male partners on the need for women's participation in decision-making at the household level as well as increase availability of formal education to women.

KEYWORDS

Child health

Decision-making

Food security

Malnutrition

Women empowerment

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DEDICATION

To my mother and my son

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LIST OF ACRONYMS

BMI	-	Body Mass Index
BIHS	-	Bangladesh Integrated Household Survey
CAPI	-	Computer Assisted Personal Interview
DHS	-	Demographic and Health Survey
EA	-	Enumeration Area
EBFSS	-	Experience-Based Food Security Scales
EEP	-	Extra-Household Environmental Parameters
EFA	-	Education For All
FAO	-	Food and Agricultural Organization
FASDEP	-	Food and Agricultural Sector Development Policy
FEM	-	Fixed Effect Model
FIES	-	Food Insecurity Experience Scale
FTF	-	Feed The Future
GDHS	-	Ghana Demographic and Health Survey
GDP	-	Gross Domestic Product
GEE	-	Generalized Estimating Equations
GLSS	-	Ghana Living Standards Survey
GOLM	-	Generalized Ordered Logit Model
GSS	-	Ghana Statistical Service
HFSSM	-	Household Food Security Survey Module
IFAD	-	International Fund for Agricultural Development
IFPRI	-	International Food Policy Research Institute
IMF	-	International Monetary Fund
IV	-	Instrumental Variables

MoFA	-	Ministry of Food and Agriculture
NAFCO	-	National Food Buffer Stock Company
OLS	-	Ordinary Least Squares
PHS	-	Population and Housing Survey
QR	-	Quantile Regression
REM	-	Random Effect Model
SDG	-	Sustainable Development Goals
UNDP	-	United Nations Development Programme
UNICEF	-	United Nations Children Fund
USAID	-	United States Agency for International Development
USDA	-	United States Department of Agriculture
VoH	-	Voice of Hungry
WB	-	World Bank
WFP	-	World Food Programme
WHO	-	World Health Organization
WTO	-	World Trade Organization

CHAPTER ONE

INTRODUCTION

Eliminating all forms of discrimination against women and girls, as well as eliminating hunger, achieving food security and improving nutrition, as stipulated in the Sustainable Development Goals (SDGs) 5 and 2 respectively, is not only is it a basic human right, but it is also essential to accelerate development. SDG target 2.1 and 2.2, which seeks to end hunger, achieve food security and improve nutrition has become one of the major objectives developing countries such as Ghana seek to achieve by 2030. It has been proven over the years that eradicating all forms of discrimination against women and girls and empowering them, as enshrined in SDG 5, has a multiplier effect and helps drive up economic growth and development across the board. Hence, over the years, the United Nations Development Programme (UNDP), in collaboration with other United Nation partners, as well as the global community at large has underscored the role of women empowerment in promoting development (Shroff & Kam, 2011; United Nations, 2016).

Globally, there is still uneven distribution of resources among women and men in the labour market in some regions, with women systematically denied equal access to jobs (United Nations, 2016). Women also experience sexual violence and exploitation, unequal division of unpaid care and domestic work, discrimination in public office, limited access to productive capital in the agricultural sector and severe hunger. For example, women constitute only 20 percent of non-agricultural employment in South Asia, West Asia, and North Africa (Shroff & Kam, 2011; United Nations, 2016).

Due to the diverse roles women play in the households (ranging from cooking, taking care of children, and engaging in economic and productive activities in the households), women empowerment has been considered as a prerequisite to achieving food security as well as improving the nutritional status of children (Verhart, van den Wijngaart, Dhamankar & Danielsen, 2016). Even though some works have been done on food security and child malnutrition in Ghana, there is more to be done, since food insecurity and child malnutrition still persist despite the economic success the country has experienced over the years. That is to say, in order to end hunger in households and malnutrition among children in the country, it is necessary to steadily address the factors that cause hunger and malnutrition and find ways to help deal with these factors. This study, therefore, contributes to the literature by providing empirical evidence on how different dimensions of women empowerment, measured by a women's education attainment relative to their partners, acceptance towards domestic violence and women's decision-making, helps in explaining the nutritional status of children under the age of five and household food security in Ghana.

Background to the Study

The notion of food security has been used as a welfare measure at the household level. People are considered food secured when they have availability and access to adequate, safe, and nutritious food at all times. Food security is seen as one of the important conditions that must be achieved for an individual to be nutritionally secure and to maintain good health. However, prevalence of hunger and undernourishment persist today in spite of considerable growth in per capita food availability. Globally, 795 million

people do not have enough food to lead a healthy, active life which is equivalent to 1 in 9. Out of this figure, 1 in 4 lives in sub-Saharan Africa (FAO, 2015; Lang & Barling, 2012). For instance, a report released by the World Health Organization (WHO) in 2017 showed that 11 percent of the global population is hungry, while 20 percent and 33.9 percent of the people living in Africa and Eastern Africa respectively are hungry as depicted in Figure 1.

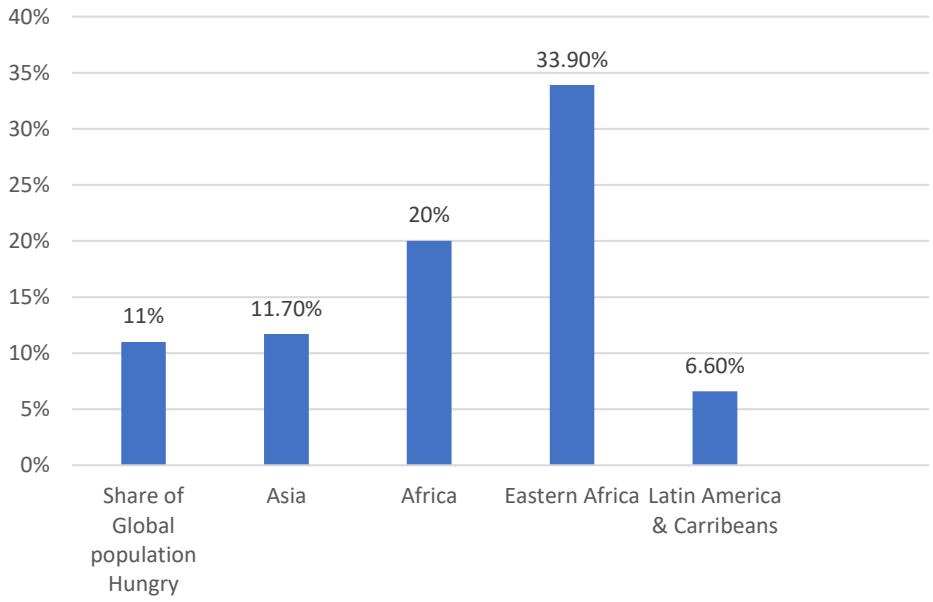

Figure 1: Prevalence of hunger across regions

Source: World Health Organization, (2017).

It is worrying to note that, after a steady decline in the prevalence of hunger for over a decade, global hunger is now on the rise, affecting quite a significant number of people, with multiple forms of malnutrition threatening the health of millions of people worldwide. For instance, according to WHO and the World Food Programme (WFP) reports that were released in 2018, severe food insecurity was found to be higher in 2017 than in 2014. Thus, in 2017, the number of people that were undernourished was estimated to have

reached 821 million. Undernourishment and severe food insecurity appeared to be increasing in almost all the subregions of Africa as well as in South America (WFP & WHO, 2018). In Figure 2, it can be seen that severe food insecurity in Africa increased from 25.4 percent in 2016 to 29.8 in 2017, which is far higher than the percentage of people experiencing severe food insecurity in the world.

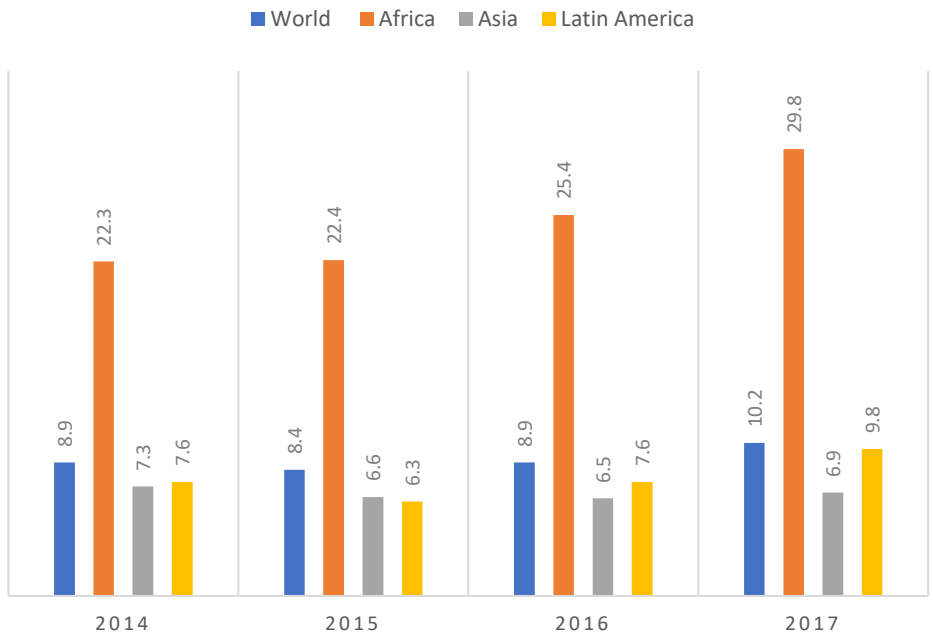

Figure 2: Prevalence of severe food insecurity across regions

Source: FAO, IFAD, UNICEF, WFP, & WHO (2018)

Adequate nutrition is also critical to children's growth and development (Glover-Amengor *et al.*, 2016). The period from birth to two years is important for growth, health, physical, mental and cognitive development. Poor childhood nutritional status, with its lasting impact on economic growth and health, is well known because malnourished children remain a major public health problem facing many low and middle-income countries. (Glover-Amengor *et al.*, 2016). About half of all deaths in children under the age of five are due to malnutrition, resulting in the loss of nearly 3 million young

lives every year (UNICEF, 2017). Nutritional status of children under age five can be measured by their anthropometric indicators of children, that is, their height-for-age, weight-for-age and weight-for-height. These anthropometric indicators describe the various dimensions of child growth in a particular linear growth path (Briend, Khara, & Dolan, 2015; Garenne, Myatt, Khara, Dolan, & Briend, 2019).

Height-for-age (Stunting) is the poor growth experienced by children as a result of malnutrition, frequent infections, and insufficient psychological and social stimulation. Stunted children are those whose height for age is less than two standard deviations from the average WHO Child Development Standards. (WHO, 2008). Low weight-for-height (wasting) or also known as thinness, is a severe process of weight loss in children, which is often associated with acute starvation, whereas low weight-for-age (underweight) refers to children under five whose weights are less than two standard deviations below the median weight of age group in the international reference population. The international reference population is the population against which the growth of children can be compared. Underweight reflects body mass relative to the chronological age of the child (WHO, 2008).

Globally, stunting among children under the age of five has declined over the years, however, it is still high in some regions especially Africa. For instance, in Western and Central Africa, the prevalence of stunting was at 33.5 percent in 2016 even though it has declined from 41.2 percent. A similar case can be found in Eastern and Southern Africa, with 34.4 percent stunted children under the age of five as shown in Figure 3. Even though the global prevalence of wasting is 7.7 percent among children under the age of five,

South Asia, West and Central Africa, and the Middle East recorded the highest rates of 16 percent, 9.2 percent, and 7.4 percent respectively as depicted in Figure 4.

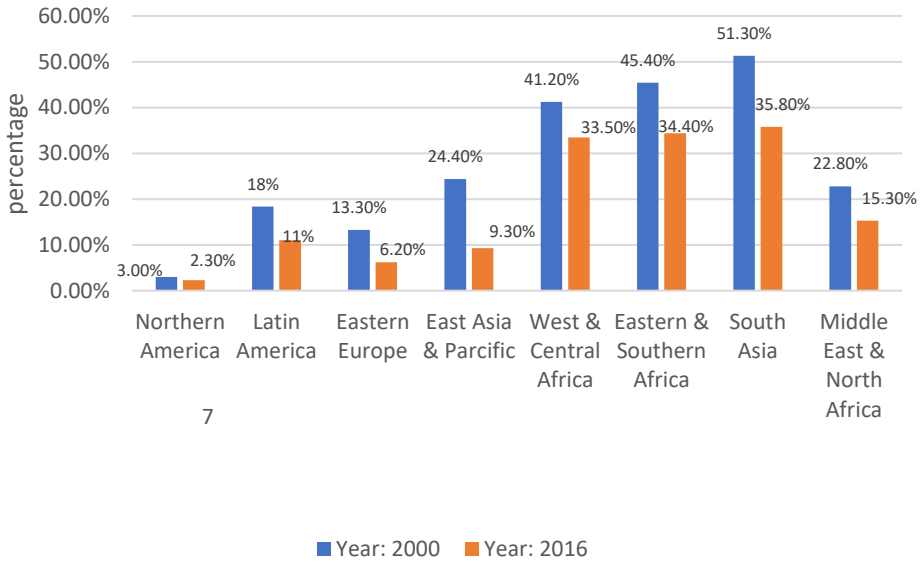

Figure 3: Prevalence of Stunting across Regions

Source: (UNICEF & WHO, 2017)

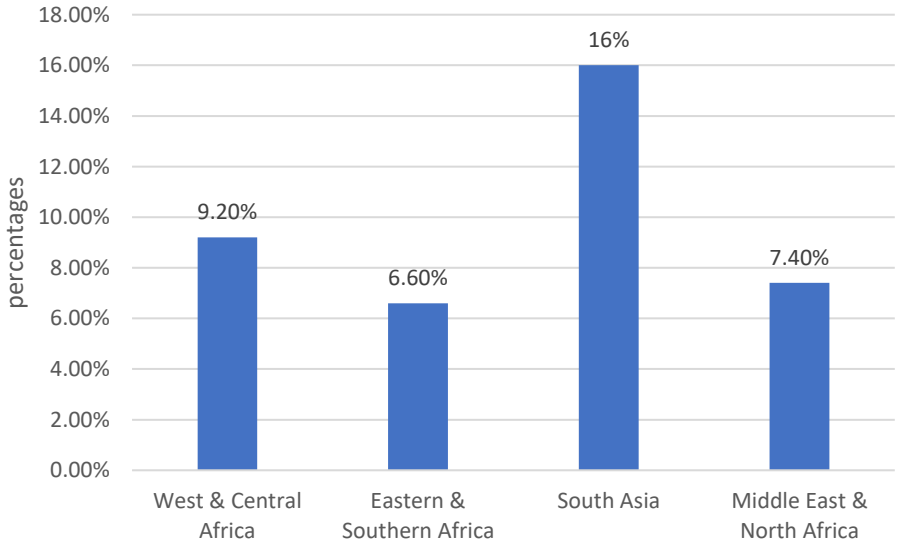

Figure 4: Prevalence of wasting across Regions

Source: (UNICEF & WHO, 2017)

Aside the fact that global severe food insecurity is increasing, its negative impact on children is also rising. In 2017, almost 151 million children who were below the age of five were stunted, while the lives of more than 50 million children worldwide remain at risk of wasting. In 2017, children who were overweight were recorded as affecting more than 38 million children under the age of fiveOut of this figure, 25 and 46 percent were recorded in Asia and Africa respectively (UNICEF, WHO, & IFAD, 2018). For instance, as of March 2019, prevalence of overweight among children under the age of five had increased from 4.9 percent to 5.9 percent, as shown in Figure 5 below (World Bank & UNICEF, 2019).

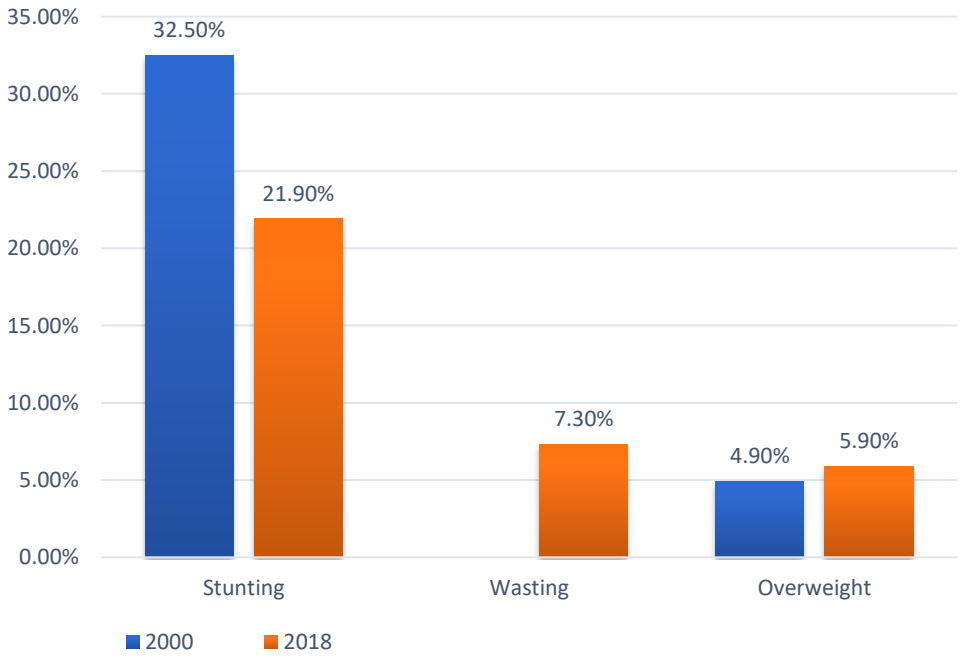

Figure 5: Prevalence of malnutrition among child under-five

Source: World Bank & UNICEF, 2019

Ghana has not been left out as far as malnutrition in children and household food insecurity is concerned. According to the Ghana Demographic and Health Survey report, (GSS, 2014), 19 percent of children were stunted, 5 percent wasted, and 11 percent underweight. However, this is not to deny the fact that there has been a decline in the rates of stunting and wasting as well as underweight over the years. For example, the percentage of children who are stunted has steadily decreased from 30 percent in 2003 to 19 percent in 2014, and the proportion of wasted children (children who are underweight) has decreased from 22 percent in 2003, 9 percent in 2008 and further decreased to 5 percent in 2014, while the proportion of underweight children decreased from 14 percent in 2008 to 11 percent in 2014, as shown in Figure 6 below. However, it must be emphasized that the prevalence of stunting is still high and needs to be addressed (GSS, 2014).

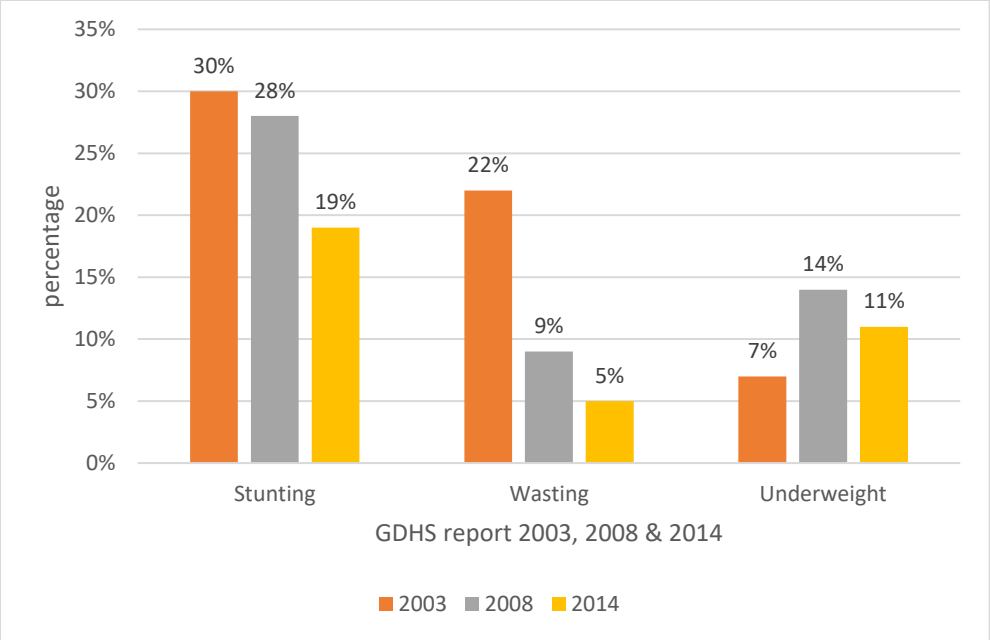

Figure 6: Prevalence of malnutrition among under-fives in Ghana

Source: GSS, 2014

A cursory glance of GDHS 2014 report also indicated that the prevalence of malnutrition among children differs among the different age categories in Ghana. For instance, an analysis by age group, as depicted in Figure 7 shows that the peak of growth retardation occurs among children aged 24 to 35 months (28%) and the lowest (6%) among children aged 6 to 8 months. Weight-for-height (wasting) is highest in children 9-11 months (11%) and lowest in children 36-47 months (1%), while underweight peaks among children. aged 18-23 months (15%)), followed by 24-35 months (GDHS, 2014).

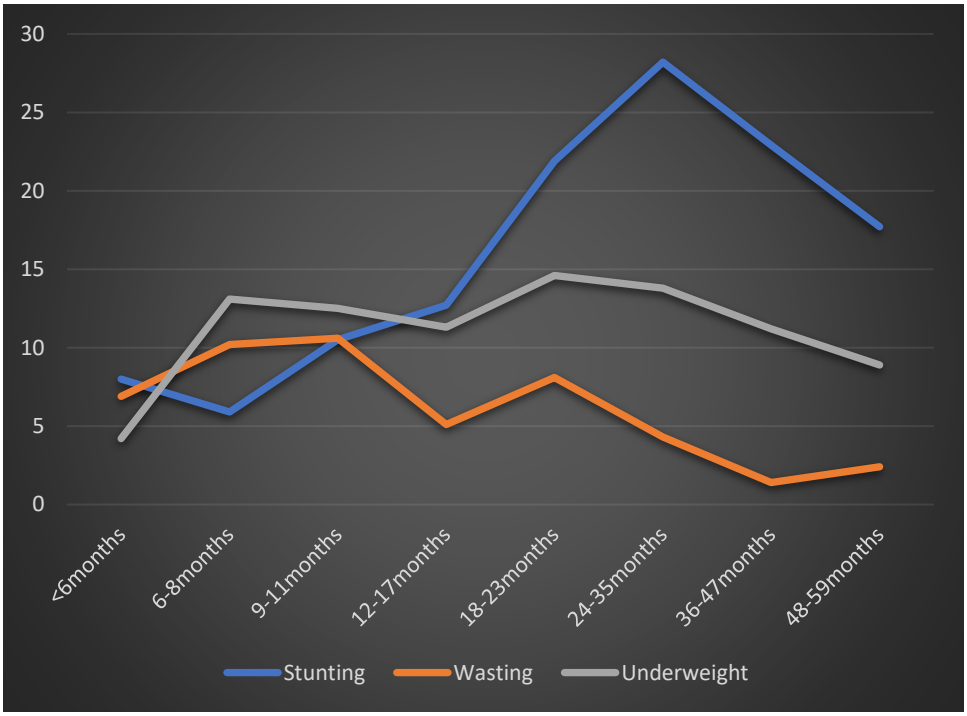

Figure 7: Nutritional status of children by age

Source: GSS, 2014

Ghana is facing imminent food insecurity as the average performance of the agricultural sector is declining. In nearly two decades, food aid and commercial food imports have reached about 4.7 percent of food needs. Annual agricultural food productivity and availability depend on rainfall

during the growing seasons and between growing seasons. This leads to food insecurity in families, making community areas impoverished and facing chronic challenges. There are food insecurity situations in all regions due to scarcity of resources and limited alternative livelihood opportunities for most people to meet their food needs. Bad weather and forest fires had a severe impact on small agricultural enterprises (Darfur and Rosentrater, 2016). Nearly 2 million people are vulnerable to food insecurity across the country. This means that any unexpected natural or man-made effect will drastically affect your food consumption pattern. A total of 1.5 million vulnerable people living in rural and urban areas live in the following seven regions of Ghana: Brung Ahavu (11 percent), Ashanti (10 percent), East (8 percent)) and Volta (7 percent) . The remaining 0.5 million people are in the three northern regions (Darfour & Rosentrater, 2016).

Comprehensive report issued by the World Food Program revealed that food insecurity is still rampant in all regions of the country, with the three northern regions leading the way. Of 100 people in the Upper East, Upper West and North regions, 63 percent cannot afford a full meal per day. Next comes the Volta region, where 61 percent of the total population is plunged into extreme poverty. The Central Region, Ashanti Region and Eastern Region scored 58, 53 and 57 percent respectively, while Greater Accra, Western and Brong Ahafo regions scored 52, 59 and 55 percent, respectively. Once again, the report indicated that 2.4 million Ghanaians, representing 8.2 percent, live in extreme poverty because they cannot spend up to GH ¢ 3 per day on food. (FAO & UNICEF, 2018a, 2018b).

Over the years, interventions and programmes have been put in place by the UNICEF to reduce the rate of malnutrition among children across the globe and also enhance food security among households. Some of these interventions include infant and young child feeding programmes; nutrition enhancement programme; prevention and management of severe, moderate, and acute malnutrition. However, much needs to be done in order to effectively eradicate the prevalence of malnutrition and food insecurity among households.

Women's contributions to the economy have often been underestimated while their work in the agricultural sector has been invisible (Olumakaiye & Ajayi, 2006). However, this trend is changing, as empirical evidence over the years has underscored the role of women empowerment and its positive impacts on nutritional status of children as well as household food security (Arimond et al., 2010; Holmboe-Ottesen, 1989; Malapit & Quisumbing, 2015; Verhart, Van Den Wijngaart, Dhamankar, & Danielsen, 2016). There is also a growing evidence to support the fact that income in the hands of women contributes more to improving household food security and child nutrition than income found in the hands of men (Olumakaiye & Ajayi, 2006). Women play a critical role as food producers, managers of natural resources at their disposal, income earners as well as caregivers. Hence, giving women equal access as men can improve household food security as well as nutritional status of children.

Findings on the role of women in reducing malnutrition and hunger are supported by the views of policymakers. For example, De Schutter (2013) argued that sharing power with women is an acronym for reducing hunger and

malnutrition and is the most effective step for realizing the right to food. He also urged world governments to adopt transformative strategies for food security that address cultural constraints and redistribute roles between women and men. In the context of child health outcomes, since women are often the primary caregivers of children, reallocating decision-making roles in favor of women can lead to improved child health outcomes. (de Schutter, 2013; Imai, Annim, Kulkarni, & Gaiha, 2014).

In spite of the important role performed by women in agriculture and food production, they have lower access to productive resources compared to their male counterparts because they are faced with various economic, social, and political barriers (Anunobi, 2002). Smith et al. (2003) associated the low status of women to factors such as less control over resources, lower decision-making power in the household and children's affairs, less access to health services, low level of education, and time constraints. This low status could also relate to their wellbeing as well as that of their family in terms of household nutrition and food security, thus resulting in low economic growth in the country and hence the need for their empowerment.

Women's empowerment, therefore, can be conceptualised as women's power to make choices and their ability to access the components of quality of life as well as women's relative position or exercise of power within the gender system (de Schutter, 2013; Imai, Annim, Kulkarni, & Gaiha, 2014). It should be noted that empowerment and poverty reduction concepts apply not only to women, but also other people who are disadvantaged in the society; hence, efforts towards empowering women must be especially cognisant of the implications of broader policy action at the household level (Malthora, Schuler

& Boender, 2002). However, in many circumstances, women's empowerment is reflected in intra-household resource allocation in household outcomes, for example, the nutritional status of children (Imai et al., 2014). That is to say that solutions regarding child nutrition and household food security must not be limited to addressing technical and environmental issues but must also incorporate issues like women's empowerment at the household level in helping solve these societal issues.

Statement of the Problem

In order to address the challenges associated with food insecurity and malnutrition among Ghanaian households and put in place measures to curb such menace, Government of Ghana, with the help of other international agencies, has implemented various policy interventions. Some of these interventions include Ghana Zero Hunger Strategic Review Programme; Feed the Future programme by the USAID, 2012; Ghana's Country Programming Framework (CDF) 2013-2016; and Planting for Food and Jobs. Even though these programmes have sought to achieve some progress, one cannot deny the fact that food insecurity is still a challenge, as 1.2 million Ghanaians are considered food insecure (USAID, 2014; WFP, 2017). A cursory glance at the Ghana Living Standards survey round seven datasets indicates that there exist significant differences in the prevalence of food insecurity across the ten regions in the country as depicted in Figure 8.

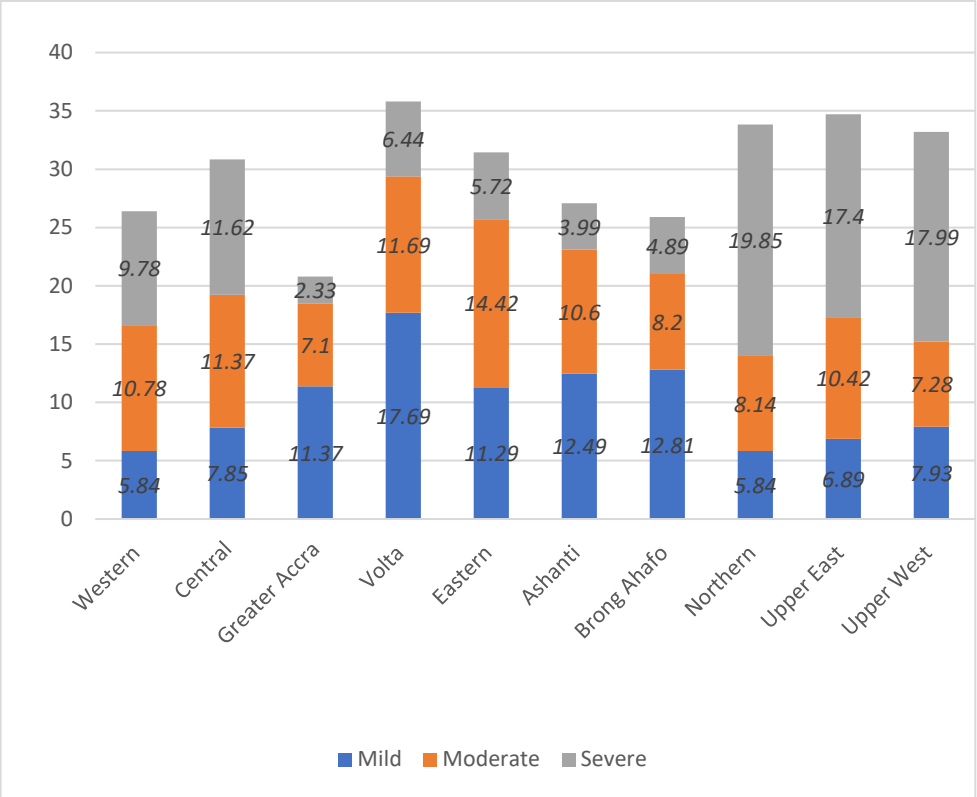

Figure 8: Prevalence of moderate to severe hunger across regions in Ghana

Source: Essilfie, 2020.

Figure 8 shows that the prevalence of severe hunger is highest in the Northern Region (19.85%), followed by Upper West and Upper East Regions (17.99% and 17.4%) respectively. Another notable concern as far as food security issue in Ghana is concerned is that it has taken some form of gender dimension, whereby quite a significant number of women are suffering from severe to moderate hunger, despite their active involvement in agricultural activities ranging from planting to marketing agricultural produce (Britwum & Akorsu, 2016; Britwum, Akorsu, & Baidoo, 2019; FTF, 2014; GSS 2013). Figure 9 shows the prevalence of moderate to severe hunger by gendered households in Northern Ghana. It can be deduced that the probability of a household to go hungry, if headed by females, is 43 percent, as against male-

headed households (36 percent), while absolute hunger is 4 and 3 percent for female-headed and male-headed households respectively.

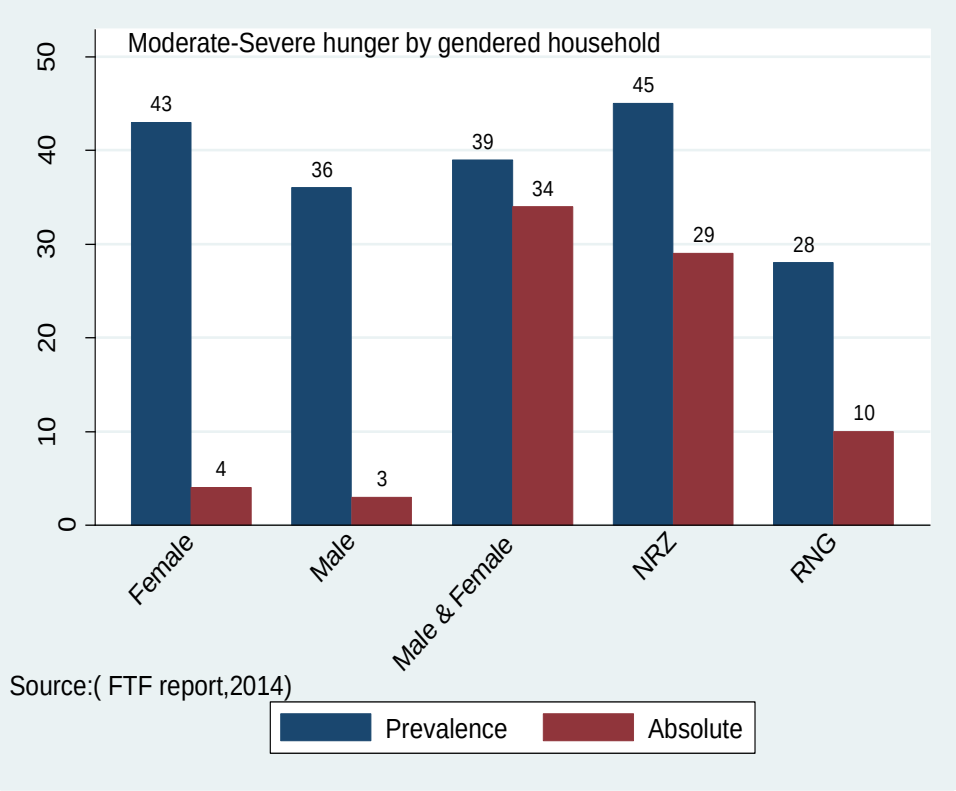

Figure 9: Hunger levels by Household types in Northern Ghana

Source: FTF, 2014

Furthermore, children under-five are not left out as far as prevalence of malnutrition is concerned. For instance, a study done in Lower Manya Krobo Municipality in the Eastern Region of Ghana by the Ministry of Health (MoH) in 2017 found that 40 percent of children of respondents who were under five years of age were malnourished (MoH, 2017). Despite various interventions implemented by various governments in Ghana to improve female participation in agricultural productivity, there is still gender inequality that particularly affects women working in the agricultural sector. The disenfranchisement of women and the prevalence of gender stereotypes limit

women's access to power, decision-making, resources, and the realization of rights. (Koira, 2014).

With reference to the first empirical chapter of this thesis which, addresses women empowerment and nutritional status of children, extant literature on factors affecting nutritional status of children has concentrated mainly on economic and social factors as well as mother's education and infrastructure as major factors contributing to improvement in child's nutritional status (Allendorf, 2007; Smith et al., 2003; Smith & Haddad, 2015; Subramanian, Ackerson, Subramanyam, & Wright, 2007). For instance, using data from 1970 to 2012 for 116 countries in 2015, Smith and Haddad (2015) found that safe water access, sanitation, women's education, gender equality, and quality of food availability in countries are the major determinants for reducing the incidence of stunting in countries (Smith & Haddad, 2015).

A limitation of the study by Haddad and Smith (2015) as well as other studies such as Malhotra and Schuler (2005), Aliber and Hart (2009), Baiphethi and Jacobs (2009), Meinzen-Dick Quisumbing, Behrman, Biermayr-Jenzano, Wilde, Noordeloos & Beintema, 2011; Malapit and Quisumbing (2014), and Sharaunga (2015) on factors affecting child's nutrition is that these studies did not take into account the fact that behavioural responses to the nutritional status of children differ between different points in the conditional distribution of a child's health, and thus the effect of these factors on an overweight child may not necessarily be the same as for a malnourished child.. According to WHO (1996) nutritional status of children can be categorised into four main dimensions. Children with Z-scores below minus 3 standard deviation below the mean on the WHO's child growth

standard are classified as severely malnourished, while children with Z scores below minus 2 standard deviation below the mean of WHO's child growth standards are classified as moderately malnourished. However, children with Z-scores between minus 1 and 1 and those with Z-scores above plus 2 standard deviations are classified as normal and overweight respectively. However, these studies failed to take into consideration these categories and how each category is affected as a result of changes in behavioural responses. Also, studies that have tried to estimate a single dimension of women empowerment on child's nutritional status at different points in conditional distribution used arbitral quantile values, which does not truly reflect the exact nutritional groups as this may lead to wrong conclusions (Kandpal & McNamara, 2009; van der Meulen Rodgers & Kassens, 2018). There is, therefore, the need to recategorise the nutritional status of children, using internationally approved measure of child nutritional status in order to determine how varying levels of women empowerment affect each category of nutritional status, as this will help determine factors that affect the health of the child.

Also, one of the main questions central to empowerment intervention strategy revolves around which aspects of women's empowerment significantly improves people's livelihoods and wellbeing (Eneyew & Bekele, 2012). Existing empirical works that have analysed women's empowerment and food security have concentrated on a single measure of women empowerment: either education of the mother or autonomy (De Schutter, 2013; Malapit & Quisumbing, 2015; Meinzen-Dick & Quisumbing, 2011). Women's empowerment is a multidimensional concept and, hence, a single

measure may be inaccurate. Therefore, understanding the dimensions of women's empowerment that result in improved livelihood is crucial for policies geared towards improving food security and child nutrition. Furthermore, existing studies failed to realize that there are inter-household variations in the levels of women empowerment, and each of these has a significant effect on the level of household food security.

Also, in an attempt to measure food security, various studies have adopted the measure of dietary diversity and food consumption score as a measure of food security (Amugsi, Mittelmark, & Oduro, 2015; Amugsi, Lartey, Kimani-Murage, & Mberu, 2016; De Schutter, 2013; Malapit & Quisumbing, 2015; Meinzen-Dick & Quisumbing, 2001). However, these studies failed to take into consideration the fact that policymakers require information on who is currently food insecure and who is vulnerable to experiencing food insecurity in future and how different dimensions of women empowerment can help improve the state of food security of households from a worse form of food insecurity to a state of no hunger. In knowing this, policy makers will be able to determine which aspect of women empowerment is necessary in improving household food security. One of the steps towards empowering women and their full participation in rural development and food security strategies is the collection and analysis of sex-disaggregated data to understand the differences in roles in food production and cash crops, as well as the differential of administrative and financial control of women over production, hence empirical evidence on varying perspective of women empowerment and how it affect household food security will enable policy makers on which aspect of empowerment should be given maximum priority

It will also help policy makers to ascertain the proportion of households who are suffering from moderate to severe food insecurity. This means that using dietary diversity alone measures diet quality in households, but may not give a clear picture of the prevalence of hunger in households.

In addition, Feed the Future report (2012) highlights gender disparities in terms of food security in northern Ghana, with higher incidence among female-headed households. However, a study done in Ghana on women empowerment and food security in northern Ghana by Tsiboe, Zereyesus, Popp, and Osei (2018) failed to analyse the sources of the factors that account for these differences, whether these differences are due to some explained factors or unexplained factors, and how women empowerment can help address such issues, as well as the most dominant measure of women empowerment necessary for mitigating the negative effect of food insecurity among households in northern Ghana in addition to indicating how varying levels of women's empowerment in households helps explain food security status in households. It is, therefore, necessary to empirically analyse how varying levels of women's empowerment explains food security and nutritional status of children in Ghana. This study, therefore, seeks to examine three dimensions of women empowerment, measured by women decision-making, women's education attainment relative to their partners, and acceptance towards domestic violence is related to child's nutritional status and household food security and also determine the most dominant measure of women empowerment necessary for eradicating malnutrition among children and improving household food security.

Objectives of the study

The main objective of the study is to examine the effect of women's empowerment on the nutritional status of children under age five and household food security in Ghana. The specific objectives are to:

1. To identify the relationship between different perspectives of women empowerment on child's nutritional status at different point in its conditional distribution.
2. Examine the joint effect of women empowerment and food security on child's nutritional status
3. To investigate different dimensions of women empowerment on household food security in Ghana
4. Determine the factors accounting for differences in food security status in gendered household types in northern Ghana.

Hypotheses of the study

In view of the above stated objectives, the study focuses on the following research hypotheses:

i. Varying perspectives of women empowerment have a significant effect on the child's nutritional status at different points in its conditional distribution.

ii. The joint effect of women empowerment and food security has a significant effect on the child's nutritional status.

iii. The probability of a household becoming food secure increases as women empowerment increases

iv. The probability of female-headed household being vulnerable to food insecurity in northern Ghana is attributed to differences in endowments

Purpose of the study

The purpose of this study is to investigate the effect of women empowerment on household food security and nutritional status of children in Ghana from an objective perspective. It seeks to contribute vital knowledge to build academic literature on how women empowerment helps improve the state of household food security and nutritional status of children and provide policy recommendations for safeguarding households against hunger and malnutrition in children below the age of five. Women empowerment and household food security have emerged because Ghana is faced with imminent food insecurity and malnutrition across the various regions in the country, with greater impact on women and children and, hence, a comprehensive study on this issue will go a long way to inform policymakers on how women empowerment can help eradicate these menace.

To achieve this purpose, three relationships are examined in this thesis: (1) women empowerment on different categories of nutritional status of children under the age of five, (2) women empowerment and household food security in Ghana, (3) contextualisation of women empowerment on food security in northern Ghana and identification of the factors that account for differences in the food security status between male-headed and female-headed households in northern Ghana.

Significance of the study

It is clear that the key feature of sustainable and improved livelihoods is capacity building of the main actors in family well-being, who are women. Most development organizations recognize the links between food insecurity and gender issues and attach great importance to women's empowerment as a means to reduce child malnutrition and food insecurity in general. (Chaudhary, Chani, & Pervaiz, 2012; FAO, IMF, & UNCTAD, 2011; Thapa & Gaiha, 2011). There is growing evidence that investments in women empowerment contribute to improved broader development outcomes related to health, education, poverty reduction, improved food security, and child health. This study is useful because it adopts a holistic approach and identifies the dominant dimension of women empowerment relevant for improving child health outcomes and food security in Ghana. Policymakers can gain a better sense of direction they need to enable them to know how women can be empowered either through education or improved household decision in order to eradicate hunger and ensure proper nutrition for children.

The study will help in the development of strategies aimed at achieving food security with woman viewed as the ambit for food production and household management. It provides an in-depth understanding of the connection between the level of women's literacy, decision-making, and food security. The study documents how women's literacy, autonomy, and absence of domestic violence can help to improve child nutrition and food security in Ghana. It is a known fact that there exist high levels of food insecurity in the northern part of Ghana, with women being the most affected. Hence, the study

provides an in-depth understanding of the factors that contribute to these differences and how best it can be solved.

Delimitations of the study

This section of the study specifies the boundaries adopted for the study and the rationale underlying the choices made. Enumerated issues pertain to the geographical boundary and the nature of the literature review implied by the relationship between women empowerment, child nutrition, and food security.

This study focuses on household analysis. A nationally representative data commissioned by the Ghana Statistical Service (Ghana Demographic and Health Survey, 2014 and Ghana Living Standard Survey round 7, 2017) are used for the analysis of objectives one and two respectively, while a panel data on women empowerment and food security also collected by the Ghana Statistical Service in Northern, Upper East, Upper West and some selected districts in Brong-Ahafo from the Feed the Future data is used for the third objective. These datasets support the generalization of the findings in Ghana. Due to the fledgling nature of the problem of food security and child nutrition, empirical evidence on the subject is sparse, especially for the objective-burden measure. Therefore, the literature review is limited to available relevant evidence which suffices for the build-up of arguments and analyses.

The measure of women empowerment is a hugely undistinguishable concept, and various approaches have been adopted in its practical evaluation. Even though the study makes reference to three of these measures (relative education, women's household decision making, and acceptance towards domestic violence), it does not measure all other possible indicators that other

researchers have used, while the measure of food security is also limited to the use of dietary diversity for objective one and food insecurity experience scale for objectives two and three.

Limitations of the study

The study has provided the opportunity to investigate the issue of women empowerment and how it affects the health of children as well as food security in Ghana. In spite of its significant benefits to academic knowledge and policy, the methodological choices in terms of design, data, and estimation techniques are not entirely devoid of limitations which could not be addressed during the course of the study.

The first two objectives were based on a cross-sectional analysis of the effect of women empowerment on the nutritional status of children and household food security in Ghana. The use of a cross-sectional study may not allow for the tracking of temporal evolution of changes that may occur in the households for objectives one and two. Also, the use of food insecurity experience scale as a proxy for measuring the access component of food security does not take into consideration the supply side of the analysis. In addition, due to absence of income variable in the Ghana Demographic and Health Survey dataset, the effect of women's income on child health could not be analysed.

While attention is drawn to these limitations, the scope and focus of this study were determined by time and resource constraints. Therefore, these limitations do not detract from the research but provide avenues for further investigations.

Contributions of the study

This thesis investigated issues on women empowerment, nutritional status of children, and household food security in Ghana. It makes the following contributions derived from the academic, methodological, and policy perspectives.

Academically, this study contributes to the literature on women empowerment, child nutrition, and household food security in the Sub-Saharan Africa region and Ghana, in particular. It presents the first estimate of women empowerment and child health outcomes in Ghana by considering child health outcome at varying categories to see how women empowerment affects child health at these categories since behavioural responses on child health differ. The study suggests that the effect women empowerment and food security will have on an overweight child will not be the same as it will have on acutely malnourished child and hence gives a clear picture of the determinants of child health depending on the category under consideration.

Even though studies have analysed the effect of women empowerment on household food security, this study provides varying combinations of various empowerment levels that are likely to be present in households and how each affects the state of food security in households. Thus, it complements the subjective analysis and contributes to the first empirical evidence from the objective perspective. The finding suggests that, even though a household may have a woman who may be empowered in terms of having a higher education, if such a woman is not given the opportunity to take decision or in any way experiences any form of domestic violence, the probability of such a household to move from a worse state of food insecurity

to mild state or a state of no hunger diminishes. This, therefore, gives a clear direction as to which women empowerment dimensions matter as far improving household food security in Ghanaian households is concerned.

From the methodological perspective, varying estimation techniques are used in order to derive a practical, meaningful, and relevant analysis so far as the objectives of the study are concerned. For example, in objective one, using teta values in estimating the quantile regression gives a clear determinants of child health for the various nutritional groups specified using the WHO's approved measure for child health, and this makes this study unique from other studies that have tried to estimate child health using quantiles. The study also makes policy recommendations for policymakers concerned with empowering women and proving household food security and nutrition among children, by focusing on educating women and more importantly putting in measures to improve women's decision-making at the household level. The study suggests that households must be educated on the importance of encouraging women decision-making and education, as it is the most effective way to improve child health and food security.

Organisation of the study

In order to achieve the objectives stated in this study, the thesis is organised into eight chapters. The next chapter, which is the second chapter considers the overview of the agricultural sector in Ghana. It highlights the extent of agricultural productivity and the state of food insecurity in Ghana. A critical examination of related theoretical and empirical literature is presented in Chapter Three of this work. The main focus of the review is to highlight the concept and dimensions of women empowerment, food security, and child

nutrition. The chapter highlights key theoretical literature that is relevant to the study.

Chapter Four deliberates on the research methods. The chapter discusses the study area, philosophy of the study, and the various estimation techniques and measurement of variables that are employed in the analysis. In the fifth chapter, the study presents the very first empirical chapter on women empowerment and nutritional status of children under-five. In the sixth chapter, empirical results on varying dimensions of women empowerment on household food security in Ghana are discussed. Panel results showing the effect of women empowerment on food security in northern Ghana are discussed in the seventh chapter. The chapter further highlights the source of differences that account for the difference in the prevalence of hunger between male-headed and female-headed households and how women empowerment can help reduce the gaps. The final chapter presents the summary, conclusions, and recommendations of the study.

CHAPTER TWO

OVERVIEW OF GHANA'S AGRICULTURAL SECTOR AND THE STATE OF FOOD SECURITY

Introduction

The importance of agriculture for the development of developing economies cannot be emphasized enough. The role of agricultural development in Ghana in achieving Sustainable Development Goal 2 (end hunger, achieve food security, improve nutrition and promote sustainable agriculture), especially in eradicating hunger and malnutrition, as well as extreme poverty now is indisputable. Therefore, agriculture plays a vital role in promoting growth and reducing poverty in the Ghanaian economy. Although the contribution of the Ghanaian agricultural sector to the Gross Domestic Product (GDP) has been declining over the years, the agricultural sector remains an important contributor to Ghana's export earnings and an important source of inputs to the economy. Manufacturing sector. Two-thirds of non-oil manufacturing depends on agriculture for raw materials, with agriculture and agribusiness representing an important part of all economic activities and livelihoods of Ghana's small farmers. Therefore, this chapter provides an overview of Ghana's agricultural sector, the challenges facing this sector, and the state of food insecurity in the country.

Overview of Ghana's Agricultural Sector

Ghana's agricultural sector has been one of the key sectors in the economy that have significantly contributed to the economy's development over the years as well as a major source of food supply in the country. The sector consists of mainly four sub-sectors, namely, crops, livestock, fisheries

and aquaculture and forestry. Crops and fisheries accounted for 19.7 percent of the national GDP in 2018 (GSS, 2019). The sector has grown significantly over the years since 2007 and has benefited from higher international prices, especially cocoa. The sector is predominantly smallholder, with most farms being less than 2 hectares, although there are some large farms and farms, especially rubber, oil palms, coconut, and to a lesser extent rice. Corn and pineapple (Food and Agricultural Organization, 2011; Ministry of Agriculture, Irrigation and Water Development in Ghana, 2017) . The sector provides employment for almost half of the total labour force of the country. The main agricultural products include cocoa, cassava, yam, banana, and maize, as well as other cereals and fruits. Coconut, cotton, and oil palm constitute some of the important cash crops produced by the sector. Food crop production by smallholder farmers has increased over the years, yet the sector is characterised by low productivity, leading to higher imports of agricultural products ranging from food items to non-food items (MAFAP, 2014).

Ghana is a net importer of agricultural products, importing commodities such as wheat, sugar, rice, poultry products etc. The annual import bill on food now exceeds $2 billion estimates that is earned from the export of cocoa. High levels of urbanization and population growth are escalating the import bill, as these lead to increased demand for more quality and safe foodstuffs like meat, dairy products as well as fruit and vegetables. For instance, food imports accounted for 16.8 percent of overall merchandised imports estimated at $13.3 billion in 2015 (Asare & Essegbey, 2016; Benin, 2016). Public expenditure analysis made by FAO's Monitoring and Analysing Food and Agriculture Policies (MAFAP) showed that public expenditure

allocated to food and agriculture with an administrative cost inclusive fluctuated between 3 to 5 percent from 2006 to 2012 (MAFAP, 2014). Even though overall spending on agriculture has increased, it has not resulted in the preferred sustainable growth rate of 6 percent in agricultural GDP, which is the second objective of Comprehensive Africa Agriculture Development Programme under the Maputo Declaration (Agricultural Sector Annual Progress Report, 2013; Cooksey, 2013; Government of Ghana, 2013) .

The stated vision of the Ministry of Food and Agriculture (MOFA) is a modernised agriculture culminating in a structurally transformed economy and evident in food security, employment opportunities, and reduced poverty (FAO, 2011). In harmony with this vision, all strategic plans by the government seek to implement agricultural research and extension as one of the focus areas of policy intervention to achieve greater agricultural productivity for improved livelihoods. The approach espoused in governmental actions is meant to follow a market-driven greater involvement of the private sector. One of the main objectives stated in the Food and Agriculture Sector Development Policy (FASDEP II, 2007) is the modernisation of agriculture and increased productivity of Ghanaian farmers. The Medium Term Agriculture Sector Investment Plan (METASIP 2010-2015) is the implementation plan of FASDEP II and it is made up of six programmes which represent Ghana's priorities, with food security, emergency preparedness, and increased growth in incomes being the major areas for investment (Government of Ghana, 2013).

Development of the agriculture sector has been a priority for the government. Providing support for agri-food production and exports has been

the leading policy since 2007, with particular emphasis on modernisation of agriculture and also ensuring minimum prices for farmers. In view of this, various programmes have been implemented by the government of Ghana in collaboration with the Ministry of Food and Agriculture at the national level to help improve the agricultural sector. Such policies include the Block Farming Programme, the Fertilizer Subsidy Programme, Agricultural Mechanisation Centers, and the Irrigation Development Programme. It is estimated that these programmes together comprise about 85 percent of the Ministry of Food and Agriculture capital budget (Food & Agricultural Organization, 2011; MAFAP, 2014).

After twenty years of no large-scale government intervention in the fertilizer sector, a national Fertilizer Subsidy Programme was re-introduced in 2008 as a temporary response to spikes in domestic food and fertilizer prices that year (WTO, 2014). The programme has supported crop farmers of all sizes, which covered roughly 50 percent of fertilizer prices, and was distributed in the form of fertilizer-specific and region-specific vouchers. Block Farm Programme was launched in 2009 as part of Youth in Agriculture Programme to provide arable land for the production of some selected commodities and to provide a decent employment for the youth, especially those in the rural area. Subsidised mechanisation services and inputs, as well as extension services were made available to the farmers to be paid in-kind after the harvest of their produce.

The National Food Buffer Stock Company (NAFCO) was established in 2010, with the aim of reducing post-harvest losses, ensuring price stability and establishing emergency grain reserves. NAFCO is a state-owned

enterprise that purchases, stores, sells and distributes excess grains in warehouses across the country. Currently, 73 licensed buying companies (LBCs) are mandated to purchase maize, rice and soya beans from farmers at minimum prices, which include the total cost of production and a 10 percent profit margin for farmers (Chamberlin, 2007; FAO, 2015). In addition to ensuring food security in the country, the government of Ghana initiated Planting for Food and Job programme to improve the state of food supply in the country as well as increase job opportunity for the youth in the agriculture sector. This programme was spearheaded by the Minister for Food and Agriculture, Hon. Owusu Afriyie Akoto. The programme was launched on the 19th of April 2017, at Goaso in the Ahafo Region. The main food crops that were included were maize, rice, sorghum and soybeans as well as vegetable crops such as onion, tomato and pepper. Two years on after the implementation of the Planting for Food and Jobs, rice production gone up by 24 percent, maize by 72 percent, soya bean by 39 percent and sorghum by 100 (MoFA, 2019).

In spite of the sector's growth and contribution to GDP over the years, the agricultural sector remains largely rain-fed and subsistence-based, with outmoded technology used to produce 80 percent of the total output generated from the sector (Ghana Exporter Guide, 2012).

One important and useful definition of food security includes those offered by Bajagai (2014). According to Bajagai (2014), a household is known to be food secure when it has access to the food needed for a healthy life for all its members (adequate in terms of quality, quantity, and safety and culturally acceptable) and when it is not at undue risk of losing such access. Also,

Maharjan and KhatriChhetri (2006) advanced that food insecurity is the inability of households or individuals to meet their daily required food consumption levels in the face of fluctuating production, food prices, and income. On the other hand, Phillips and Taylor (1998) hold the view that food insecurity exists when all the household members have inadequate diets for part or all of the year. Thus, food insecurity is the absence of food security and applies to a wide range of issues ranging from famine to a period of severe hunger and malnutrition (Sen, 1985; Phillips & Taylor, 1998). This study measures food security using household dietary diversity as well as experience-based food insecurity measure to address the objectives of the study.

Constraints faced by the agricultural sector of Ghana

In spite of all the efforts put in place to facilitate the growth of the agricultural sector, there are accumulated factors that hinder the growth of the agricultural sector in Ghana, and these factors are discouraging farmers and other stakeholders from investing in the sector. Diversity in Ghana's agro-ecology has compounded these challenges (Darfour & Rosentrater, 2016). Some challenges faced by the agricultural sector in Ghana are discussed in the ensuing paragraphs.

Low levels of public expenditure and inefficiencies

Ghana's expenditure on the agricultural sector has been declining steadily both at the regional and international levels and lags behind the targeted 10 percent that was agreed during the Maputo Declaration. A review of World Bank on public spending in agriculture in Ghana showed that agricultural spending averaged about 5 percent of the total spending between

2001 and 2014 and also declined as a percentage of total GDP since 2011, reflecting tightening of the fiscal policy in the country (Benin, 2016). This includes funding in the cocoa sub-sector, meaning that non-cocoa public sector expenditure may fall below the estimated 5 percent. The public expenditure on Ghana's agriculture sector is part of the lowest in Africa and considerably below the Comprehensive African Agriculture Development Programme (CAADP) commitment of 10 percent (Kolavalli, Silver, Benin, & Johnson, 2015). Two-thirds of the Ministry of Food and Agriculture's budget is allocated to cover operating costs, with development partners financing over 70 percent of investment expenses. Operating costs are mainly allocated to payroll and input supports. These expenses replace important public goods such as access to infrastructure, irrigation, research and development (R&D), and extension services among others.

There are also problems related to agricultural services that have been moved to district assemblies. Although Ghana has implemented a policy of decentralization, much remains to be done. It must be done to give the full meaning of administrative and financial decentralization, especially to sectors such as agriculture whose job and services are absolutely essential at the local level. The provision of agricultural extension and other services at the local level is still very poor, mainly because of the low capacity, limited and untimely financing of public funds. An important part of agricultural public spending is supporting inputs supplies to farmers. For instance, in 2016, The Ministry of Food and Agriculture granted subsidies of 180,000 metric tons of granular fertilizer at a cost of GHC 120 million and an unspecified amount of organic fertilizers at a cost of 18 million. In the Cocoa Sector, COCOBOD is

the leading supplier of fertilizers, pesticides, and seedlings. The sustainability of these programs is, however, worrying, given high costs, and ineffective targeting mechanisms and operational issues such as delay announcements about whether the programs will be implemented every year, when and how it will be done. These issues result in the delay of fertilizer delivery and creating great uncertainty for the input suppliers. This impedes the development and strengthening of the country's private fertilizer supply networks (Kolavalli et al., 2015; Quiñones, Muñoz, & Ngeleza, 2011).

It is worrying that Ghana has not implemented a comprehensive agricultural census for the last 32 years. For annual production data, the Ministry for Food and Agriculture has approved annual surveys of crops and livestock conducted at the district level through agricultural extension officers. However, given the limited public funding and other constraints that affect capacity to public servants, the quality of the data is often questioned.

Human resource and managerial skills

The agriculture sector has over 60 percent of the population, with farmers, traders, and processors constituting the largest sector. Agriculture is also a critical sector for women; about half (48.7 percent) of the total female population is engaged in agriculture ranging from food production to trading agricultural produce. Although the current population of farmers is aging, the youth are not willing to engage in agricultural activities. The high rate of illiteracy among producers means a constant need for enabling their access to information on new methods, opportunities, and policies. High level of prevalence of poverty among farmers also limits their ability to respond to opportunities either because of lack of capacity or because of their risk-

aversion strategies. Changes in global trade environment are widening the gap between the skills needs of the private agribusinesses and the skills of existing manpower of service providers. Livestock specialists, e.g. veterinarians, breeders, and meat scientists, are especially limited in the country (MoFA, 2007).

Sustainable natural resource management

The agricultural sector in Ghana is based on natural resources, with much focus on crop and livestock production systems, hunting, rain-fed agriculture, and fish from natural water bodies. Outmoded practices such as bush burning and the improper use of technologies such as irrigation and agro-chemicals do not stimulate sustainability of resource use. For instance, out of the total land surface of Ghana, 60 percent is considered prone to severe erosion, causing the country about 2 percent of GDP. Although the problem is in all the agro-ecological zones, the savannah regions are affected the most. Land degradation, desertification, and soil erosion hit hardest at the local level and those most affected are the poor women and men who depend on natural resources for their survival. Communal ownership of land and lack of adequate knowledge on water management and effective agricultural practices hinder the sector's growth and development ((Darfour & Rosentrater, 2016; MoFA, 2007).

Technology development and dissemination

The fundamental reasons for levels of productivity in Ghana's agricultural sector are attributed to poor soil conditions, low and poor distribution of rainfall, diseases and pests, limited access to planting materials, seed, and livestock breeds. Due to inadequate market incentives and

inaccessibility of relevant inputs needed by farmers as well as other stakeholders, there is low adoption of improved technologies that could help increase productivity. In view of this, there exists a high rate of mortality due to diseases and inappropriate management practices. Also, lack of knowledge in post-harvest management practices, especially in the case of perishable produce, has resulted in large sum of post-harvest losses over the years. For instance, in 2007, the Ministry of Food and Agriculture reported that about 20 to 50 percent of fruits, vegetables, roots, and tubers, as well as about 20 to 30 percent of cereals were lost due to inadequate storage facilities (MoFA, 2007)

Infrastructure

One of the major constraints faced by farmers and traders of agricultural produce is their inability to transport items to market centres due to poor roads. Transportation is fundamental to the distribution of agricultural produce from the farms. Transportation helps farmers link their products to local markets, rural communities, and market places. Areas such as Afram Plains in the Western Region are faced with such unfortunate situation, making it difficult for farmers to effectively transport their goods to where they are needed. Thus, poor infrastructure worsens time constraint and productive work. For instance, lack of good feeder roads linking farms to villages means that produce has to be head-loaded and this is mainly undertaken by women, which worsen their time constraint and health. Poor road infrastructure is also affecting the cost of important inputs such as fertilizer. Also, supply of hatcheries, ponds, and cages for aquaculture is limited. Physical markets for farm produce are characterised by decrepit infrastructure, lack of suitable commodity-specific storage facilities,

unhygienic premises, and over-crowding (Darfour & Rosentrater, 2016; MoFA, 2007).

Market access constraint

In spite of Ghana's comparative advantage in the production of horticultural crops, Ghana has lower competitiveness compared to Latin America, East Asia, and neighbouring West African countries because of poor infrastructure, high cost of capital, lack of irrigation, poor skills of producers in meeting external quality standards, poor logistic management, and insufficient research capacity for horticultural sub-sector (MoFA, 2010). Other limitations to market access are lack of marketing skills, inadequate product development for effective utilisation of farm produce, and generally weak commodity value chains. The cumulative consciousness of food safety in international trade requires a growing challenge to market access, especially for high value agricultural export commodities. Quite a significant number of local consumers and producers have a low consciousness about food safety, and this has caused farmers, processors, and traders not to follow best practices in agriculture and manufacturing (Darfour & Rosentrater, 2016; MoFA, 2007).

The State of Food Insecurity in Ghana

A report released by the Ministry of Food and Agriculture in 2015 showed that about 5 percent of Ghana's population (1.2 million people) is food insecure. In 2009, it was reported by World Food Programme that approximately 453,000 people in Ghana are food insecure with 34% in the Upper West Region, 15% in the Upper East Region, and 10% in the Northern Region (WFP, 2009), while about 2 million people are vulnerable to become

food insecure nationwide. This implied that any unforeseen natural or man-made shock will momentously affect the pattern of their food consumption. People that are recorded to be vulnerable to food insecurity totaling 1.5 million live in the rural and urban areas of the following regions of Ghana: Brong-Ahafo (11%), Ashanti (10%), Eastern (8%), and Volta (7%). The remaining 0.5 million people are found in the three northern regions (Abu & Soom, 2016; FAO, 2015; Hesselberg & Yaro, 2006; Swindale & Bilinsky, 2007).

Several factors affect the food security status of farmers and households in Ghana. Lack of adequate storage facilities, lack of financial credit, and pressing need for cash to pay off debt are the major factors which push farmers, especially to sell their produce at low prices at harvest and buy at high prices during the lean periods of production (Brinkman, De Pee, Sanogo, Subran, & Bloem, 2009). The Ashanti Region continues to experience high rates of food insecurity due to high magnitudes of variance in the determinants of 'food security' in both rural and urban areas. These differences are due to the falling standards of factors such as the number of livelihood activities head of the household is engaged in and total own production of the household (Darfour & Rosentrater, 2016; Frimpong & Asuming-Brempong, 2013; Wilson et al., 2017).

Food insecurity in areas that are subsistence-oriented is measured using months of inadequate household food provisioning. Areas that are subsistence-oriented produce primarily for home consumption, and only a few amount of the produce are sold in the market (Abu & Soom, 2016; Hesselberg & Yaro, 2006; Lang & Barling, 2012). Most farmer households experience

significant levels of food insecurity lasting from 3 to 7 months. Upper East Region is the worst affected because it experiences 6 month period of food shortage (FAO, 2011). In 2012, the Ministry of Food and Agriculture outlined the following as part of plans aimed at improving agriculture to ensure food security:

i. Modernising agriculture by improving productivity, mechanization, irrigation, and water management

ii. Maintaining national strategic stocks such as food storage, distribution, and improved nutrition

iii. Preventing and managing of emergencies and expanding national strategic stocks through effective early warning systems

iv. Enhancing peoples' knowledge of the importance of optimum nutrition by improving advocacy on nutrition education and food fortification

v. Reducing post-harvest losses, and improving storage and distribution systems through capacity building of relevant stakeholders. This included proper methods for harvesting, primary processing, grading, storing, and ensuring good linkages between producers and markets.

vi. Ensuring food production systems (macro and micro nutrients and food fortification) as an essential aspect of food processing.

vii. Reducing risks resulting from natural disasters and disease/pest outbreaks and ensuring adequate food stock

availability (MoFA, 2012; Food & Agriculture, 2011; FAO/IFAD/WFP, 2015)

According to Narayan et al. (2000), hunger is the bottom-line of poverty, and food is central to poor people's concerns. Hence the poverty level of households is the reflection of their food insecurity status. In a report filed by the World Food Programme (2012), it was found that, in the Upper West, Upper East and Northern Regions of Ghana, more than 680,000 people were considered to be either severely or moderately food insecure at the time of the survey. Of the food insecure, 140,000 were classified as severely food insecure, having a very poor diet consisting of just staple foods and some vegetables and oil.

The Upper East Region has the highest proportion of households which are either severely or moderately food insecure (28 percent). In the Northern and Upper West Regions, 10 percent and 16 percent of households respectively, were either severely or moderately food insecure. The five districts with the highest proportion of households which are either severely or moderately food insecure were Wa West (42 percent), Central Gonja (39 percent), Talensi-Nabdam (39 percent), Kassena-Nankana West (35 percent), and Kassena-Nankana East (33 percent).

Apart from the highest incidence of food insecurity recorded in the three northern regions of Ghana, about 1.5 million people who are very susceptible to food insecurity could be found in the other remaining regions. Brong Ahafo Region has the highest share of these people (11 percent), followed by Ashanti Region (10 percent), Eastern Region (8 percent), and the Volta Region (7 percent) (Frimpong & Asuming-Brempong, 2013). This,

therefore, poses a contemporary threat to the food security of the country since more and more people are fed from the less productive farms.

Chapter Summary

This chapter provided a run-down of the overview of Ghana's agriculture sector, constraint faced by the sector, as well as the state of food insecurity in the country. The chapter revealed that despite the significant contribution that the agriculture sector makes towards the country's GDP growth as well as provision of food to the citizens, Ghana is faced with food insecurity challenges, with huge disparities between the southern and northern parts of the country. It was also revealed that the sector is not devoid of challenges such as poor infrastructure, market accessibility problems, poor human development skills, and lack of appropriate technology, and this hinders the growth of the sector and, hence, the need to implement effective strategies if the country seeks to achieve SDG2.

CHAPTER THREE

LITERATURE REVIEW

Introduction

The goal of this chapter is to examine existing theoretical and empirical literature that relates to women empowerment, nutritional status of children, and household food security. This will put the current study in perspective. The chapter consists of two major sections. The first section examines the theoretical literature that links women empowerment and food and nutrition security while the second section comprises the review of existing empirical works.

Theoretical review

Before diving into the empirical discussion about the relationship between women empowerment, food security, and nutritional status of children under-five, empirically, it is necessary to situate these issues within a theoretical context. For this reason, the first section of this chapter provides theoretical literature that underpins the current study while the second section provides literature on empirical works.

The theory of bargaining models

Intuitively, policymakers as well as scholars expect that, if the bargaining power of women increases, there is the tendency of it affecting key developmental outcomes, such as the health of children, wellbeing of household members as well as that of the women themselves. Also, it is argued that empowerment of women affects key household production such as food security, wage work, and household chores. In view of that, many theories have been developed since the 1980s to understand the bargaining

process within the household. Until quite recently, most researchers viewed households as a collection of individuals who behave as if they agreed on how best to combine their resources. Here, it was assumed that the household head makes decisions on behalf of household members, with all resources pooled together (Becker, 1974; Park, 2007). This approach has been extended to include household decision about caring for children, crop adoption, education, fertility, health, home production, supply of labour , land tenure, and migration as well as formation and dissolution of marriage and divorce (Alderman, Chiappori, Haddad, Hoddinott, & Kanbur, 1995; Becker, 1974). This approach is sometimes called common preferences model or benevolent dictator model. It is mostly referred to as the Unitary model because it describes how a household is assumed to act as one.

However, the unitary model has been empirically invalidated by the work of Lundberg, Pollak, and Wales in 1997 who found the empirical evidence that family spending on women's and children's clothing, relative to men, increased after the policy change in United Kingdom transferred a child allowance to wives. Before the change in policy in the United Kingdom, child benefits were based on a tax allowance and since the husband's income was the dominant source of taxable income, the tax allowance gave the child benefit directly to the father. However, this was later given to the mother in a form of weekly, non-taxable payment, and that was where it was realised that there was a significant increase in the expenditure on women and children's clothing relative to men (Imai et al., 2014; Rode, 2011).

It has also been criticised for the fact that it allows price to differ for household members, for example, the wage for wife and husband to differ.

However, it assumes that all resources such as land, labour, and capital are pooled. This assumption, however, requires that, at least, one member of the household is able to monitor household members to ensure compliance of pooled resources and sanction those who fail to adhere to this. Another limitation is that it also fails to incorporate the process by which resources are distributed within the households, ignoring the inequalities that may exist within the household. For example, resources may be distributed on the basis of individual differences (Alderman et al., 1995). Also, one of the most noted criticisms of the unitary model is the comment made by Folbre (1986). According to him, the suggestion that women and female children "voluntarily" relinquish leisure, education, and food would be somewhat more persuasive if they had the opportunity to demand their fair share. In 1995, Alderman, Chaippori, Haddad, Hoddinott, and Kanbur argued that it was time to shift the burden of proof and claimed that there was sufficient evidence against the appropriateness of the unitary model (Alderman et al., 1995; Doss, 2013) and hence, the development of the non-unitary models.

The non-unitary model in which personal preference and bargaining power matter consists of cooperative bargaining models and non-cooperative bargaining models. In the non-cooperative bargaining model, the assumption of binding and costless enforceable agreements are all relaxed and hence allow for the possibility of inefficient outcomes. In the non-cooperative model, there is the absence of pooled budgets constraint, and that is the distinguishing feature of non-cooperative model (Rode, 2011).

This thesis makes use of the cooperative model of the non-unitary model. The cooperative model is based on the hypothesis that decision process

that takes place in the household, irrespective of how it turns out to be, produces a Pareto-efficient outcome. Under the cooperative model, it is assumed that members obtain their satisfaction from their own consumption of commodities and public goods while the bargaining process is influenced by extra-household environmental parameters (EEP) (Chiappori, 1988; McElroy, 1990; McElroy & Horney, 1981; McElroy & Horney, 1990).

Following the cooperative model of the non-unitary model, we assume that a household is made up of a mother, *m*, a father, *f*, and a number of children, *k*, seen to be a "public good" for both parents. Children are not decision-makers and for easiness, parents care about the nutritional status or health care of their children. Let x_j be the jth person consumption (*j*= *m*, *f*), and q be the (average) health quality of children. The *jth* person utility is defined as U_j $(x_j, q_j / A_j)$. Here, A_j, EEP is seen as a vector consisting of exogenous factors that determine the preference of the individual j. A_j may depend on the factors determined outside the households, such as unearned income for *j* as well as his or her individual characteristics. Each individual is assumed to choose x_j (own consumption) to maximize q (child health). In this setting the household utility function is defined as $\text{E}U_m\,(x_m\;, \text{q};\; A_m) + (1 - \text{E})\; U_f(x_f\;, \text{q};\; A_f)$ where *E* represents the bargaining power of the mother (wife) in the household (*0*< *E* <*1*). The household utility maximization problem is specified as follows:

$$\text{Max } U^H = \text{E}U_m\,(x_m, \text{q}; A_m) + \;(1 - \text{E})\; U_f(x_f\,, \text{q}; A_f) \quad \ldots\ldots\ldots(1)$$

$$x_m, x_f, q$$

Subject to:

$$\text{I} = p_m x_m + p_f x_f + p_{\text{c}}\text{q} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

I is a household's income, p_i is the private good for the mother or the father, and p_c is the shadow price of public goods that is children in this case. In general q^* (health quality of child) will depend on parameters such as $_E$ p_c, I, p_i *and* A_i as follows:

$q^* = q^*(_E, I, p_m, p_f, p_c, A_m, A_f)$ ... ... (3)

The model highlights decision made by the household in relation to the health of the child. For instance, "bargaining power" $_E$ presents women empowerment represented by female educational attainment and participation of female in decision-making. Given that the mother is more likely to value q than the father, the stronger the bargaining power of the mother is reflected in higher $_E$. A_i reflects each household member's attitude towards health care. Also, it is expected that economic growth increases the household income level and improve the health of the children (Imai et al., 2014; McElroy, 1990).

Capability approach

The capability approach to food security was basically developed by Jean and Amartya Sen in 1989 in their book titled *Hunger and Public Action*. Even though the authors did not make any reference to the concept of food security, they developed a general analytical framework for studying hunger, chronic or transitory, and all related aspects, based both on the capability approach of Sen (Sen, 1985, 1999) and his entitlement approach (Burchi & De Muro, 2016; Sen, 1985, 1999). A baffling fact about this book and its framework is that, despite the fact that it is considerably broader and far more reaching than the entitlement approach, it is less known, discussed and utilised both by scholars and practitioners. In the book, the authors explained why the

entitlement approach is not sufficient for a general approach to hunger issues and the need to move beyond food entitlements towards nutritional capabilities.

Sen (1981) argues that every household is endowed with a bundle of resources that can either be exchanged directly for food or used to produce the quantity of food that is adequate to keep its members from being chronically starved and deprived. Thus, if the initial entitlement set of a household does not include food and cannot be exchanged for a commodity bundle with an adequate amount of food, then members of that household are bound to become hungry and food insecure, even if food availability increases for society as a whole. On the other hand, Sen's work was largely theoretical and thus cannot be taken as primie facie evidence of a universally verified positive relationship between entitlement of household and household food security. According to the Burchi & Muro (2016), the focus on entitlement which is mainly concerned with command over commodities is only instrumentally important, but rather concentration has to be based on human capabilities (Burchi & De Muro, 2016; Dreze & Sen, 1990). A more reasoned goal would be to make it possible to have the capability to avoid undernourishment and escape deprivations associated with hunger, that is, the capability that one has to get in order to be free from hunger and malnutrition (Dreze & Sen, 1990).

Unlike the entitlement approach, the capability approach takes into account the quality, utilisation and social acceptability of food and the interaction with other basic capabilities such as health, education, and ability for one to take part in household decision-making. The capability approach also differs from the ''mechanical'' view of food insecurity as a lack of

micronutrients or other food properties generally advocated by nutritionists (Burchi, Fanzo, & Frison, 2011). Food insecurity, within the framework of capability approach, can be seen as the result of a lack of education, health, or other basic capabilities that constitute people's well-being and hinder people from freely expressing themselves within a society or gender mainstream.

Initially, Sen (1999) argued for major components in assessing the capability: (a) the importance of real freedoms in the assessment of a person's advantage, (b) the multivariate nature of activities that give rise to happiness, (c) concern for the distribution of opportunities within society, and (d) the balance of materialistic and non-materialistic factors in evaluating human welfare. Sen's concerns are grounded in a deep understanding that social and institutional arrangements limit and, in many cases, restrict people's and importantly women's, ability to realise a life of value. The most fundamental democratic and human right, Sen would argue, is the ability of the individual to invent herself, free from the constraints of poverty and authoritarianism (Deprez & Butler, 2007).

There are two major components of the capability approach, namely functions and capabilities. Sen defined functionings as parts of the state of a person, in particular the various things that he or she manages to do or be in leading a life while capability of a person reflects the alternative combinations of functioning the person can achieve and from which he or she can choose one collection (Owen & Goldin, 2015; Sen, 1993). Fuctionings are the "being and doings," for example, being free from hunger, being literate, being healthy, being part of decision-making with a community or households, being respected, and being free from abuse just to mention a few (Robeyns, 2003).

Robeyns highlighted that what is of importance is the freedom, that is, the opportunities or capabilities that people have to lead the kind of lives they want to lead, to do what they want to do, and to be the person they want to be. According to Sen, some of the capabilities that are relevant in the social assessments include the freedom to be well nourished and live a disease-free life, the freedom to move around, be educated, and be able to participate in public life irrespective of the gender of the person (Owen & Goldin, 2015; Robeyns, 2003).

Even though quite a significant number of scholars have written extensively about the capability approach, it is Nussbaum's (2011) study which is well known. Nussbaum's kind of the capability approach differs from that of Sen's in the sense that Nussbaum has developed a conclusive list of central human capabilities and noted that capabilities go beyond the abilities residing inside a person to include opportunities or freedoms created by a combination of personal abilities and the social, economic, and political environment.

However, Sen (2005) has always objected to the idea of a precise or fixed list of capabilities. Some of the capabilities that he finds to be relevant in social assessment include the freedom to be well nourished and to live disease-free lives, to be able to move around, to be educated, and to be able to participate in public life. Sen does not object to listing capabilities, but he is unwaveringly against any proposal of a "grand mausoleum" to one fixed and final list of capabilities (Owen & Goldin, 2015).

Another concept that is important to Sen's (1999) capability approach is the notion of 'agency.' Sen argued that an agent is someone who acts and

brings about change. He defined human agency as what a person is free to do and achieve in pursuit of whatever goals or values he or she regards as important. Selvam (2008) points out that youth and most especially women are a vulnerable group by virtue of the transitional stage of life they find themselves and, hence, the need for a clear assertion of set of rights proper to them (Owen & Goldin, 2015; Selvam, 2008).When considering women capabilities in Africa, certain cultural and contextual elements are also relevant because culturally specific social aspects matter to the way in which women can be or do what they would like to be or do. According to Selvam (2008), a good government is the one that is able to create an environment for its citizens' potential so that all the citizens are able to access their capabilities.

Social stratification theory

Inequality and stratification have been seen as essential sociological considerations for food security. Research on hunger that includes, among other things, class, gender considerations and race will best capture the most critical barriers to food access and distribution. Absolute poverty, in particular, is seen as a major determinant of food insecurity, and it is important not just at the individual or household level, but in larger form, as indicated by the prevalence of some 82 low-income food deficit countries (Scanlan, 2003). As a group, women throughout the world are widely discriminated against, and accessing food is no exception to this, as girls and adult women are more likely to experience malnutrition and related health consequences than their male counterparts (Bennett & George, 1987; Charlton, 1984). This has been the case, despite the fact that women are responsible for most of the world's

food production, processing, and preparation and the fact they work on lands that they cannot own or even be legally entitled to in many cases.

Throughout most of recorded history over the years, women have been taking a "back seat" to men. Mostly, men continue to have more physical and social power and status than women either at the household level or at the macro level. Women's need for education and training is widely acknowledged. They do much of the agriculture at subsistence level, yet the technical and agricultural education is usually provided for men (Lovel & Feuerstein, 1985). Women's inferior position, in comparison to men, is abundant and easily identifiable. This phenomenon is deeply rooted in the patriarchal culture, history, and traditions (Friedan, 2013; Tang, 2016).

In the past century, a lot of efforts have been made to reduce the structural gender inequalities. For example, in the first wave of feminism during the nineteenth and early twentieth century, suffrage was claimed and some legal known obstacles to gender equality were abolished (Lorber, 1994). While social and political movements took up the fight against the gender inequality in reality, the scholars in social science in universities also played a role through academic research on issues of how to promote women's participation in social activities. For instance, in the 1960s, feminists argued that modern scientific understanding, specifically information about sociology and politics, is produced by patriarchal institutions, which mostly favours men and ultimately reflects a 'masculine world view' (Keller Fox, 1985; Keller & Mbewe, 1991; Tang, 2016). Social class theories, such as that of John Goldthorpe's, have regarded the female as largely peripheral to the class system (Marshall, Newby, Rose, & Vogler, 2005). This approach is reflected

in the gendered labour divisions within households, where the man is characterized as the "breadwinner," whilst the woman retained the primary responsibility for the domestic sphere.

The Concept of women empowerment

Feminists are credited with the word "*Empowerment*" in international development studies and practices, and it was introduced as an approach to women's role in development (Britwum et al., 2019). Since the second half of the twentieth century, the issue of women's empowerment has gained importance among scholars on national and international platforms. However, the concept was not deeply ingrained into the government's policies and programs until the declaration of the "Women's Decade" in 1975 (Mandal, 2013). Since then, global agenda has incorporated women's development as part of their objective. For instance, Sustainable Development Goal 5 seeks to achieve gender equality and empower all women and girls in view of the fact that women's empowerment has been seen as a means to other ends.

A policy research report by the World Bank (2001), on gender equality, recognises gender equality both as a development objective in itself and as a means to promote growth, reduce poverty, and promote better governance. Another related dual justification for supporting women's empowerment has been enunciated in the policy statements put forth at several high-level international conferences in the past decades, such as the Beijing Platform for Action, the Cairo Programme of Action, the Millennium Declaration, and the Convention on the Elimination of All Forms of Discrimination against Women (Gillis, 2001; Golla et al., 2011).

Despite its widespread usage, the word *empowerment* is difficult to define. Empowerment of women has been defined in 1986 by Griffin. She pointed out that empowerment is "being able to make a contribution at all levels of society and not just in the home and Power also means having women's contribution recognised and valued" (Griffin, 1986). Also, McWhirter (1994) was quoted by Aspy and Sandhu in their book, *Empowering Women Equity: A Counseling Approach.* They delineate that empowerment is the process by which people, organisation, or groups who are powerless or marginalized (a) become aware of the power dynamics at work in their life context, (b) develop the skills and capacity for gaining some reasonable control over their lives, (c) which they exercise, (d) without infringing on the rights of others and (e) which coincides with actively supporting the empowerment of others in their community (Aspy & Sandhu, 1999; Mandal, 2013).

Freire (1996, 2018) in his book *Pedagogy of the Oppressed* discussed empowerment in a formal way for the first time. After him, many scholars discussed it as human potential, especially for women empowerment. Shetty (1992) concluded that empowerment is easy to understand, but difficult to define. According to him, one is empowered if he or she experiences a sense of self-confidence and self-worth—a person who can critically analyse his or her political and social environment and is able to exercise control over decisions that affect his or her life. Moser (as cited in Moser & Moser, 2005; Rahman, 2013), at first, discussed it as a redistribution of power.

As a concept, the word *empowerment* is widely used, however, it is rarely defined. Disagreement arises with the concept of empowerment because

the root concept "power" is itself disputed. Some definitions proposed by authors focus on varying degrees of restraint, on the availability of one person to get another person or group to do something against their will. Such power is located in decision-making processes, conflict, and force and could be described as zero-sum. To try to come closer to an understanding of empowerment, we need to look at the actual meaning of the term that has been variously used by writers and researchers, in a variety of contexts (Rahman, 2013; Rowland et al., 1997).

According to Rowland et al. (1997), in order for one to understand the process of empowerment, it is necessary for one to know that power can take many different forms, such as (a) Controlling power, which refers to compliance or manipulation; (b) Generative power, which enables one to create first-hand possibilities and actions without domination; (c) Power with, a sense of the whole being greater than some of the individuals, especially when a problem is collectively tackled by a group; (d) Power originating from within, which represents the spiritual strength and distinctiveness that is inherent in every individual.

According to Rowland et al. (1997), this forms the basis for self-acceptance, which leads to respect and acceptance of one another. Hence, using the "power over" concept, they saw empowerment as a way of bringing on board people who are not involved in decision-making. This puts a strong emphasis on involvement in civil structures and formal decision-making and, in the economic sphere, on one's ability to obtain an income that enables his or her participation in economic decision-making. According to them, an individual is empowered when he or she is able to make the best use of

opportunities that are available to him or her without constraints. That is to say that an individual is empowered when he or she is able to maximise opportunities without any form of discrimination or limitations. Within the, "power to" and "power with" interpretation of power, empowerment is a concern with the processes by which people become aware of their own interests in relation to others (Rahman, 2013; Rowland et al., 1997).

Dimensions of women empowerment

Women empowerment is seen as a prerequisite for the development of a country as well as for the minimisation of the level of poverty and promotion of economic growth (Chaudhary, Chani, & Pervaiz, 2012; Mujahid, Ali, Noman, & Begum, 2015). Women empowerment term has different connotations, which depends on the political, social, and economic context in which it is used. In 2001, it was defined by the World Bank as the expansion of the freedom of choices and action, which could increase women authority and control over resources and decision regarding their life.

Similarly, women empowerment is a process through which women achieve the ability to control, take ownership over resources, and make strategies of life choices (Kabeer, 2001, 2003; Mujahid et al., 2015). Women empowerment has many dimensions, ranging from economic, social, cultural, legal, political, and psychological. Women empowerment is preferred not only for the development of a country but also for the minimization of poverty and promotion of economic growth (Mujahid et al., 2015). For instance, education has been noted as one of the determinants of empowerment of women, which also lowers the fertility rate and improves the earnings of women in households (Jejeebhoy, 1995; Jejeebhoy & Sathar, 2001; Mason, 1987). In

political empowerment, education plays a critical role in the sense that educated women are better informed about their legal rights and they are able to actively participate in political decision-making process (Mujahid et al., 2015; Rihani, 2006; Roudi-Fahimi & Moghadam, 2006). Even though there are varying dimensions of women empowerment, this thesis focuses on women's education relative to that of her partner, decision-making, and acceptance towards domestic violence as measures for women empowerment.

Education empowerment

It is a known fact that education increases the self-confidence of women, helps them to find better jobs, and work shoulder to shoulder with men (Malik, 2013). Thus, education empowers women to make decisions that improve their children's health, their own well-being, and chances of survival. It informs others on how they can effectively control and prevent the occurrence of disease, and also, it is an essential element of efforts to reduce malnutrition, especially among younger children. Education can increase women's awareness of their rights, boost their self-esteem, and provide them the opportunity to assert their rights (Malik, 2013).

Since the UN Declaration of the Decade of Women in 1975, attention and action on women's concerns have steadily increased, and education, whether it is the form of consciousness-raising or skills acquisition, has been one of the areas women's organisations, government agencies, and international donor agencies focus on. The fundamental assumption was that, if women understood their conditions, knew their rights, and learned skills traditionally denied to them, empowerment would follow. The International Seminar on Women's Education and Empowerment, therefore, was convened

amidst the discussion on the relevance of women's education in improving the situation of women, in the short term, and in emancipating women, in the long run (Medel-Anonuevo, 1995; Stromquist, 1999).

The World Declaration on Education for All (EFA) in 1990 that came out of the EFA World Conference in Jomtien stated that education is a fundamental right for all people, women, and men, of all ages, throughout our world. Sustainable Development Goals 4.5 (seeks to eliminate gender disparity in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disability, indigenous people, and children in vulnerable situations) and 5.1 (end all forms of discrimination against women and girls everywhere) have put gender, education and empowerment firmly on the international agenda. An assumption, however, that often seems to be made is that there is a simple, direct relation between formal education and empowerment. Putting girls in school are considered the ultimate empowerment solution. This assumption is reflected, for example, in the fact that the target will help eliminate gender disparity that exists in education (Guinée, 2014; Griggs et al., 2013).

Autonomy

Autonomy is defined as the ability to obtain and make decisions about one's own life (Acharya, Bell, Simkhada, Van Teijlingen, & Regmi, 2010). It facilitates the accessibility of basic necessities such as food and other material resources such as land, income, and prestige within the family and the community within which the person finds himself or herself (Acharya et al., 2010; Chaudhary et al., 2012). On the other hand, women's autonomy is defined as the degree of women's access to, and control over, material

resources (including food, income, land, and other forms of wealth) and to social resources (including knowledge, power, and prestige) within the family, in the community, and in the society at large (Dixon-Mueller, 2013; Sapkota, Bastola, & Marsh, 2015). Researchers often measure autonomy of women with an index such as one's participation in the decision about purchases of household items, ability to move freely and use of household assets and finance (Amugsi et al., 2016; Nigatu, Gebremariam, Abera, Setegn, & Deribe, 2014; Woldemicael & Tenkorang, 2010).

It is established in the literature that women's autonomy at the household level facilitates their access to household resources such as income, food income, power and prestige. However, studies have shown that, when women are denied the opportunity to exercise their autonomy, they are unable to access certain resources that could impact positively on their lives such as health, and hence, face various economic burdens (Agarwala & Lynch, 2006; Mullany, Hindin, & Becker, 2005) For example, Woldemicael (as cited in Woldemicael & Tenkorang, 2010) asserted that women's say regarding day-to-day household decision-making and spousal communication are significant in explaining behaviour and fertility preferences. According to Imai et al. (2014) and Osamor and Grady (2016), women's autonomy in household decision-making is extremely important for better maternal and child health outcomes (Imai et al., 2014; Osamor & Grady, 2016)

Acceptance towards domestic violence

Violence against women constitute an obstacle for social and economic empowerment of women (Lopez-Avila, 2016). Domestic violence is seen to have a negative effect on the health and psychological development of women

and adverse effect on the health of their children in their later life. Research has shown that boys who witnessed their mothers being beaten stands a higher risk of becoming violent partners in future as well as families that experience spousal violence are more likely to experience violence against children (Hesse-Biber, 2011; You, Hug, & Anthony, 2015; Hillis, Mercy, Amobi, & Kress, 2016; Lopez-Avila, 2016). Being victims of domestic violence has economic consequences. Households that have children exposed to domestic violence are likely to develop behavioural problems, such as exhibiting out control behaviour and imitating behaviour.

The costs of violence against women are widespread throughout society. Every recognisable effect of violence has a cost, whether it is direct or indirect. Direct costs come from the use of goods and services for which a monetary exchange is made such as hospital bills or cost spent on medication. Effects of violence against women also include intangible costs such as premature death, pain, and suffering for which there is no imputed monetary value in the economy and this lowers their empowerment. Costs can also be borne in the short-run or the long-run. It is, therefore, imperative to put in place measures that will help curb any form of violence against women.

Economic empowerment

The economic empowerment of women cannot be overemphasized. It is a prerequisite for sustainable development, pro-poor growth, and a tool for achieving Sustainable Development Goals such as Goals 1, 2, 5, and 8 since women's economic empowerment cut across the various sections of the SDGs. Women's economic empowerment is the capacity they have to participate in, contribute to, and also benefit from the growth process in ways which

recognise the value of their contribution, respect their dignity, and make it possible for them to negotiate a better distribution of the benefits of growth as well as a tool against poverty (Biswas, 2010; Eyben, Kabeer, & Cornwall, 2008).

Policies and programmes ranging from strengthening economic rights for women under the law to providing greater access to quality child care and financial literacy can potentially spur women's economic empowerment and reduce gender gaps in economic performance. Researchers over the years have underscored the need for women's economic empowerment. Women's economic empowerment helps to boost productivity, increases economic diversification and income equality as well as positive development outcomes. For instance, increasing the female employment rate in developing countries to match that of developed countries such as Sweden could boost GDP by over USD 6 trillion (Kabeer, 2008; Women in Work index, 2018).

Evidence from a range of countries confirms that increasing the share of household income controlled by women, either through their own earnings or cash transfer, changes the spending patterns in a way that benefits children (Women in Work index, 2018). Despite the positive effect of women economic empowerment, globally, over 2.7 billion women are legally restricted from having the same choice of jobs as men. According to the IMF report in 2018, out of the 189 economies that were assessed, 104 economies still had laws that prevented women from working in specific jobs, while 59 economies had no laws on sexual harassment in the workplace, and in 18 economies, their husbands can legally prevent their wives from working. Women are more likely to be unemployed and paid less than men. For

example, in 2017, global unemployment rate for men and women stood at 5.5 and 6.2 percent respectively (Verick, 2018). It is, therefore, imperative for policymakers in Ghana and the world economies at large concentrate on policies that improve women economic empowerment since the benefits that economies are likely to achieve far outweigh the cost that would be incurred.

The concept of food security

Food adequacy and the basic right to be free from hunger are recognised in the 1948 Universal Declaration of Human Rights, ratified by over 150 countries (Eide, 1998; United Nations Human Rights & Food and Agricultural Organization, 2006). Strictly speaking, there is no consensus on the definition of food security. About three decades ago, Maxwell (1996) enumerated more than 200 definitions in published writings and argued that, rather than being an analytical weakness, the wide variety of definitions depicts the diversity in people's experiences and description of the problem. Consequently, Maxwell proposed that understanding the concept of food security and responding to it require a clear recognition of the difficulty and diversity in the term. While not discounting the complexity of food security as underscored by Maxwell (1996), the definition proposed at the world food summit in 1996 has been proven to be more useful (FAO, 2002). In view of that, this study conceptualises household food security as the situation in which people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for a healthy and active life (Maxwell, 1996).

Dimensions of food security

Four dimensions of food security are identified in the literature. These include: (a) food availability, (b) food access, (c) food utilization, and (d) food stability.

Food availability

Availability of food captures physical existence of food. It addresses the supply side of food security by looking at sufficient quantities of quality and nutritious food from domestic agricultural production and import. At the national level, food availability is a combination of domestic food production, commercial food imports and exports, food aid, and domestic food stocks, whereas at the household level, it could be from own production or purchases from local marketing outlets (Bajagai, 2014).

Food access

Prior to 1980s, the emphasis on food security was on the availability of foods in the international and national level. There was a critical shift in the conceptualisation of food security following the publication made by Sen on poverty and famine in 1981. At the household or individual level, availability of food supply was not seen as guarantee for food security, especially if physical or economic access is compromised. Food access is defined as when members of households have enough resources to obtain food that is sufficient in quantity and of quality. This, to a large extent, depends on the amount of resources available to the household. In addition to that, accessibility is also a question of social and policy environment. Drastic changes in these dimensions may have an adverse effect on production and hence affect access of food to households. Food access refers to the ability to obtain sufficient and

balanced diets to meet the nutritional requirement of all who need food (Bajagai, 2014).

Food utilisation

Last but not least, food utilization is another dimension of food security captured in the literature. This dimension addresses both the volume of food consumed by individuals in the household as well as how and when they eat. It also includes preparation of the food, within-household food distribution, water and sanitation, as well as safety practices. In other words, it measures the ability of food consumers to derive the optimal benefits from the food they eat (Kuwornu, Suleyman, & Amegashie, 2013).

Stability

The last dimension of food security refers to the stability of the other three dimensions over time. An unstable political climate, economic factors (such as price volatility and unemployment), or weather conditions can dramatically impact the availability, accessibility, and utilization of food (Food and Agricultural Organization, 2008).

Measuring food security

Indicators of food security are essential for global monitoring, targeting food and economic aid, evaluating programs, and for informing policy. The indicators must, therefore, be able to measure food security in a comparable manner across regions of the world. Due to this, the question of measuring food security in a way that captures all aspects of its definition has been pertinent for several decades (Perez-Escamilla, Gubert, Rogers, & Hromi-Fiedler, 2017). In spite of the importance associated with measuring food security, there is no consensus on a single "gold standard" indicator that

captures all aspects of food security (Clay, 2002; Rosen, Meade, Fuglie, & Rada, 2016; Upton, Cissé, & Barrett, 2016).

Before the 1980's, food availability was the measure for food security. The focus on the availability of food was largely influenced by the economic and political conditions of the time, where food supply was a concern due to conflicts and post-World War II (Jones, Ngure, Pelto, & Young, 2013). There was a paradigm shift in the use of availability as a measure to food security to access in 1981. Proxy measures such as dietary diversity and anthropometry indicators were used to measure food security at the household level (Maxwell, 1996). From the early 1990s, tools that are able to capture the experiences of becoming hungry were developed in the form of experience-based questions which, to a large extent, demonstrated a shift from the objective indicator to more of a subjective indicator (Radimer, 2002; Webb et al., 2006). While the experience-based questions for measuring food, security are mostly preferred for measuring food security both at the household or individual level, a number of tools are used to measure food security, some of which are described below.

Prevalence of undernutrition by Food and Agricultural Organization

The prevalence of undernourishment (PoU) is defined as the proportion of a country's population consuming less dietary energy than their requirements (Cafiero & Gennari, 2011). In all, three parameters are used to calculate the PoU. First of all, Food and Agricultural Organization's country Food Balance Sheets are used to calculate per capita caloric intake of staple foods. A coefficient of variation of national income distribution is then used to measure the distribution of calories in the population. Then a calorie cutoff

point is established, taking into account differences in the utilization of energy within the population with respect to their age, physical activity, body weight, and sex (Masset, 2011; Naiken, 2002). This method helps to calculate the total number of people that are undernourished as a percentage of the total population.

Anthropometric indicators

Anthropometric indicators are used to measure the health and nutritional status of individuals, and this is an indirect way of measuring the impact of food security. The most commonly used anthropometric indicators are based on weight-for-age (underweight), height-for-age (stunting), and weight-for-height (wasting) among young children and infants (Pérez-Escamilla & Segall-Corrêa, 2008; Perez-Escamilla et al., 2017). These anthropometric indicators are used to gain information relating to the nutritional status of the individual. For instance, the weight for-age index is used to identify both chronic and/or acute undernutrition. Weight for-height is used to identify short-term nutritional stress brought about by illnesses or shortages in food supply (World Health Organization, 1995). Although anthropometric indicators are an inexpensive standardized method of measuring nutritional status, other factors such as mother's care and sanitation, among other household factors, must be taken into consideration when using anthropometric indicators as a measure of food security (Jones et al., 2013).

Experience-based food security scales

Experience-based food security scales (EBFSS) aim to directly measure the access component of food security, especially the behavioural responses to shortages in food access. The construct of EBFSS is basically

based on ethnographic research that was conducted by a group of researchers from the University of Cornell who conducted a research on low-income women in upstate New York, regarding their experiences with food insecurity and the ways in which they coped with the situation (Radimer, Olson, Greene, Campbell, & Habicht, 1992). The team discovered that food insecure women exhibited common characteristics, which they then used as a basis for the experience-based scales that categorised food insecurity along a continuum of severity. The study showed that the mildest and earliest experiences of food insecurity are characterized by worry or anxiety pertaining to food access, followed by compromised quality of the diet. As the severity of food insecurity increases, diet quantity reduces until the point where meals are skipped or days without access to food (Cafiero, Melgar-Quinonez, Ballard, & Kepple, 2014; Melgar-Quinonez et al., 2006; Radimer et al., 1992; Webb et al., 2006).

Unlike other measures of food security, the EBFSS are able to rank the severity of food insecurity by asking well-designed questions about specific experiences, behaviors, and conditions, which otherwise would be hard to elicit (Ballard, Coates, Swindale, & Deitchler, 2013; Nord, 2014). Experience-based scales are the preferred method of measuring food security at a household and individual level because they act as direct measures of food security, rather than relying on proxy measures like the other indicators. Of the four dimensions of food security, experience-based food security scales are the only measure to evaluate the access component directly (Food and Agriculture Organization, 2014). EBFSS are cost effective; they, therefore, enable timely monitoring of food security (Food and Agriculture Organization, 2014). The

interpretation of the results is straight-forward and uncomplicated, making it an ideal tool for policy development, monitoring global trends, and evaluating interventions (Food and Agriculture Organization, 2014).

The first EBFSS that was developed by Radimer and colleagues in 1992 was the U.S. Household Food Security Survey Module (US HFSSM). This measure had an 18-point scale which directly asks people about worrying about running out of food and having to reduce the quality and or quality of foods and classifies respondents as food secure, mildly food insecure, moderately food insecure, or severely food insecure based on the number of confirmatory responses (Pérez-Escamilla & Segall-Corrêa, 2008). EBFSS, thus, gave rise to the Food Insecurity Experience Scale in 2013 (Food and Agricultural Organization, 2014). The United Nations Food and Agriculture Organization's Voices of the Hungry Project (VoH) aims to make the FIES the global standard measuring and monitoring tool for food security (Food and Agricultural Organization, 2014). The FIES is an 8-point scale, with a 12-month reference.

Women empowerment, child Health and food Security

Women empowerment has been linked to many dimensions of household health status through different pathways, spanning from the use of health services, child health, and reduction in expenditure on items that lead to poor health as well as household food security. In all, improvements in the health status of children have been one of the most cited impacts of women empowerment at the household level (Behrman, 1997; Roushdy, 2004; Thomas, 1990, 1994). For instance, Roushdy (2004) investigated intrahousehold resource allocation in Egypt and examined women's status

within the household on the investment made in human capital of children, with special focus on children's nutrition and schooling. The results showed that women who are empowered are more likely to make a positive investment in their children. He, therefore, concluded that women's role over resource allocation and decision-making regarding children is one of the critical indicators for promoting the health of children (Roushdy, 2004).

Thomas (1994) used dataset from Ghana, US, and Brazil to examine the relationship between parental education and the child's height as a proxy for nutritional status of children. In all the three countries, the results showed that education of the mother of the child has a significant positive effect on her daughter's height. In the case of Ghana, the results showed that a woman who is better educated than her husband has a bigger impact on the height of her daughter than her son. The findings from the study underscored the role of women's education in improving the health of the child. Given the primacy of food intakes, any redistribution of household resources towards food which is caused by improvement in women's status, especially education, impacts positively on overall health status.

Women empowerment is known to be associated with increase in female usage of health services such as pre-natal care, the use of health facilities during child birth, and post-natal care (Beegle, Frankenberg, & Thomas, 2001). Women empowerment as a tool for development has been underscored on the basis that it is a means to an end. For example, it can lead to household food security and poverty reduction (Francis & Moyo, 2012; Sharaunga, 2015; Sharaunga, Mudhara, & Bogale, 2016). Lack of women empowerment is one of the causes of food insecurity and global hunger.

Empowering women allow them to have more control over their lives, thus, reducing poverty, strengthening food security, and driving human development (Sharaunga, 2015).

For instance, women resource empowerment has been found to be positively correlated with household food security and poverty reduction (Meinzen-Dick & Quisumbing, 2001). Of all the facets of women's development, economic empowerment is of utmost significance to achieve lasting and sustainable solutions to address poverty and food insecurity, as it is directly linked to control of the means of production (Horwitz & Jain, 2011; Jain, Ahuja, & Kumar, 2012; Sharaunga, 2015). A higher sense of empowerment among women leads to the motivation to pursue diversified livelihood that ensures their stability of income, and hence food security (Barker, 2005).

Empirical literature

A number of works have been done on women empowerment, child health, and food security. This section seeks to review empirical works done on women empowerment, child nutrition, and food security. The review adopts a thematic approach which focuses on two main themes of the theses: (1) women empowerment and child health, and (2) women empowerment and food security.

Women empowerment and child health

The importance of women empowerment on child health has been discussed in various ways in reference to many countries. For instance, a work done in Nepal, using 3,332 agricultural households in 2015 by Malapit, Kadiyala, Quisumbing, Cunningham and Tyagi on the relationship between

women's empowerment in agriculture and production diversity and child anthropometric outcome, found that women's empowerment, measured as group membership, control over income, and reduced workload, is significant and positively associated with height-for-age Z- scores, while lower gender parity gap improves children's diet and weight-for-age Z-scores (Malapit, Kadiyala, Quisumbing, Cunningham, & Tyagi, 2015).

This work done is not devoid of some limitations despite its contribution to knowledge, as they did not examine the effect of women empowerment on the different categories of child health. This is because, the effect that women empowerment will have on a severely malnourished child will not be the same as it will have on overweight child. Hence, the use of Ordinary Least Square in estimating the effect of women empowerment on the health of the child was not appropriate. Even though the study recognised the possibility of endogeneity problem that may exist between women and child health, the instrument used may not be appropriate leading to the rejection of the instrumental variable estimation. Thus, it is not enough for researchers to abandon the issue of endogeneity due to the fact that the instrument chosen was not statistically significant. In order not to repeat similar gap in this study, this study uses internationally approved standard measure of child health, and also recategorised child health into their various nutritional group and also addressed the problem of possible endogeneity as addressed in objective one of the study.

In a similar work done in Nepal in 2001 using Nepal Demographic and Health Survey, Allendorf (2007) used three proxies as a measure for women empowerment: (1) empowerment scale made up of the number of

decisions the woman has; (2) whether the woman has a final say or joint say on issues regarding her own health, household purchases or ability to visit family members or any relation; (3) land ownership. His aim was to examine how female ownership of land and participation in household decision affect the nutritional status of children. The result from the study showed that the probability of a child to be severely undernourished increases by 10 percent if the mother does not own land while the other proxies were not statistically significant. Despite the significant contribution made by the study, the author did not investigate other household characteristics such as the household size that might have significant effects on the health of the child. The study also did not consider the possibility of endogeneity between women empowerment and child health. This issue is addressed in this study.

Malapit and Quisumbing (2014) investigated the linkages between women's empowerment in agriculture and the nutritional status of women and children, using 2012 baseline data from the Feed the Future population-based survey in northern Ghana. They used a new survey-based (women's empowerment in agriculture index) method to conduct an individual level analysis of nutrition-related indicators, including exclusive breastfeeding, children's dietary diversity score, minimum dietary diversity, and minimum acceptable diet. Children's height-for-age, weight-for-height, and weight-for-age z-scores and women's dietary diversity score and body mass index were also calculated. They used a total of 2,027 women aged 15-49 and 1,437 children under age five. Results from the study suggested that women's empowerment is more strongly associated with the quality of infant and young child feeding practices and only weakly associated with child nutrition status.

Women's empowerment in credit decisions, however, was positively and significantly correlated with women's dietary diversity, but not body mass index. They suggested that improved nutritional status was not necessarily correlated with empowerment across all domains and that these domains may have different impacts on nutrition (Malapit & Quisumbing, 2014).

Despite the fact that the study highlighted the effect of different levels of empowerment on child health, it failed to re-categorise child health. This may be the reason why the study found a weak association between women empowerment and child nutrition. Also, the study did not take into account the possibility of endogeneity that may exist between women empowerment and child nutrition.

Using bivariate estimation technique, Appoh and Krekling (2005), investigated the relationship between maternal nutritional knowledge and child nutritional status in Volta region of Ghana. Data was collected in Ghana on 55 well-nourished and 55 malnourished mother-child pairs. The bivariate results from the study showed a significant relationship between child's nutritional status and maternal knowledge. The study, even though underscore the role of mother's knowledge in improving health status of children, (weight-for-age), it failed to re-categorise the nutritional status of children using internationally approved measure of child health since behavioral responses differ.

Using data from 2014 Ghana Demographic and Health Survey, Boah, Azupogo, Amporfro and Abada (2019) estimated the prevalence of underweight, stunting and wasting, using 2720 children aged 0-59 months. The results from the multiple regressions underscored the role of women empowerment, as measured by mother's education in improving the health

status of children. The study recommended that interventions and policies geared towards improving children's nutritional status should address socioeconomic inequalities at the community level while factoring in women's empowerment programmes. In spite of the significant contribution of this study, it is not devoid of limitations. Aside the fact that the nutritional status of children was not categorised into their right nutritional groups, multidimensionality of women empowerment was not conceptualised.

Studying the pension scheme in South Africa, Duflo (2003) examined the relationship between income in the hands of black women and child health after the apartheid in 1991. Specifically, Duflo compared the nutritional status of children based on whether the household had an eligible pension recipient that is a woman aged 60 years or a man aged 65 years. Using children from households with no eligible pension receipt as the reference group, Duflo found that receipt of pension by women increases girl's weight for height by about 1.2 standard deviations. However, there was no comparable effect for pensions received by men on either girls' or boys' nutritional status. The study concluded that the status of women within South African households, in particular, if women receive independent incomes or transfers, matters for the health status of girls (Duflo, 2003).

In spite of the contribution made by Duflo, the paper is not without limitations. The concept of women empowerment is multidimensional and hence a single measure as a proxy for measuring women empowerment may not lead to a valid conclusion. It must be noted that improvement in child nutrition is a function of other household characteristics such as food security and not women empowerment alone. Hence, ignoring such an important

household characteristic makes the findings from the study bias. In order to address the issue of multidimensionality of women empowerment, three measures are used in the current study as seen in objectives one, three and four.

Liu (2008) examined the impacts of female household headship on the nutritional status of children in China. In this case, the bargaining identification strategy is guided by the definition used in the China Health and Nutrition Survey where a headship is defined as the person who plays a decisive role in household affairs; hence, an absent husband would not be considered the household head. In order to conduct the study, 1993 data extracted from the China Health and Nutrition Survey was used. This data was jointly developed by the Carolina Population Center at the University of North Carolina at Chapel Hill and the Chinese Academy of Preventive Medicine. Its rural sample consists of 32 towns and 96 rural villages that are not located in the suburb of any major cities. The survey was conducted by related city or county anti-epidemic stations under the organization of Provincial Food Inspection Services. Liu found that children whose mothers are the household head are significantly taller than the other children, especially among girls. The author also concluded that women are more likely to end up as the household heads if they are better educated than their husbands and if the household has a higher per capita income (Haoming, 2008).

Cunning, Ruel, Ferguson, and Uauy (2015) conducted a systematic empirical review of papers on women empowerment and child nutrition. The objectives of the review were to: (a) synthesise the evidence linking women empowerment and child nutritional status in South Asia and (b) suggest

possible direction for future studies. The authors thoroughly searched Global Health, Embase (classic and Ovid), MEDLINE, Campbell Collaboration, Popline, Eldis, Web of Science, EconLit, and Scopus. In all, they generated a total of 1,661 studies for abstract and title screening. After the screening, only 12 studies were selected for the study. English materials published between 1990 and 2012 that examined the relationship(s) of at least one women's empowerment domain and nutritional status among South Asian children was included. Data were extracted and synthesised within three domains of empowerment: control of resources and autonomy, workload and time, and social support.

The results from the review showed women's empowerment to be generally associated with child anthropometry indicators and also concluded that different women's empowerment domains may relate differently to child nutritional status (Cunningham et al., 2015). The limitation of this paper is that differences in population, measurement criteria for women empowerment and child nutrition, estimation techniques, and differences in data among the countries were likely to lead to inconsistencies, thereby biasing the conclusions made from the study.

Analysing data from National Family Health Survey in India, Shroff, Griffiths, Adair, Suchindran, and Bentley (2009) examined the relationship between maternal autonomy and child stunting in Pradesh, India using a total sample of 821 mothers and children. In the study, maternal autonomy was measured using four main dimensions: (a) decision making power of women in various activities including cooking; (b) freedom of movement; (c) financial autonomy; (d) attitude towards domestic violence. In all, maternal autonomy,

defined as a woman's personal power in the household and her ability to influence and change her environment, was found to be an important factor influencing child care and ultimately child health outcomes (Shroff et al., 2009).

One major limitation of this work is the use of logistic regression in estimating the relationship between women empowerment and child health. This measure is unable to determine how women empowerment affects the different categories of child health and, therefore, assumes that the effect that women empowerment will have on an acutely stunted child is the same as the effect it will have on moderately stunted children. Thus, it fails to give a clear determinant of child health at the various nutritional groups. This is addressed in the objective one of this current study.

Smith et al., (2003) examined the effects of women's status on the health of women and children. They estimated regressions for determinants of child and women's nutritional status in which both a bargaining index and measure of community gender equality were included as covariates. They also examined the impacts of bargaining power on use of prenatal and child birth services; whether the child was breastfed on first day of birth; whether the child was exclusively breastfed during the first 4 months; whether the child received treatment for diarrhoea; as well as whether the child received any vaccinations or all vaccinations for the recommended age. The study sought to answer three main questions: (a) Is women's status an important determinant of child nutritional status in the three study regions? (b) If so, what are the pathways through which it operates? (c) Why is South Asia's child malnutrition rate so much higher than SSA's?

The study found that the effect of women's status on child health differs in developing countries. This is because, in South Asia, it was found that movement towards gender equality with the household led to 13 percent reduction in the rate of underweight in children under age three while in Sub Saharan Africa, it led to only 3 percent drop. This variation in the result was attributed to the lower status of women within households in South Asia, compared to SSA, despite South Asia's relatively higher indicators for national income, education, and adult health (Smith et al., 2003; Ramakrishnan, Ndiaye, Haddad, & Martorell, 2003). The limitation of this work is similar to that cited in the work of Shroff et al. (2009). Thus, the study is unable to determine how women empowerment affects the different categories of child health and, therefore, assumes that the effect that women empowerment will have on an acutely stunted child is the same as the effect it will have on moderately stunted children. Thus, it fails to give a clear determinant of child health at the various nutritional groups. Objective one of this current study, takes into consideration the various nutritional groups and analyse how varying perspectives of women empowerment affect each of these nutritional groups.

Women empowerment and food security

Research has shown a strong relationship between gender-based discrimination and the various pathways through which individuals as well as households can access food. In order for women empowerment strategies and food security measures to complement each other and for their combined effect to be maximised, any form of discrimination faced by women and any measure that will relieve them of their burden should be explored (De

Schutter, 2013). In view of this, studies have been conducted by scholars to highlight the effect that women empowerment has on household food security.

For instance, Sraboni, Malapit, Quisumbing, and Ahmed (2014) examined the relationship between women's empowerment in agriculture on dietary diversity and adult body mass index in Bangladesh. Bangladesh Integrated Household Survey dataset collected in 2012, designed and supervised by researchers at the International Food Policy Research Institute from 2011 to 2012 was used for the study. The sample from BIHS consisted of 1,608 nonfarm and 3,895 farm households. However, based on the objectives of the study, the authors restricted their analysis to the farm households, using a total of 3,273 households. However, different samples were used for different estimations based on the specific objectives set. With the analysis that examined women's relative empowerment within the household, the sample was restricted to primary male and female decision-makers, reducing the sample size to 3,213 households. For the individual-level analysis, using women's 5 dimensions of empowerment (production, resource, income, leadership, and time), BMI values were obtained for 3,150 primary adult males and 3,263 primary adult females from farm households. For the analysis examining women's relative empowerment using the gender parity gap, the sample sizes for men and women were reduced to 3,094 and 3,203, respectively. Taking into consideration the possibility of endogeneity, the results from the study showed that increase in women's empowerment is positively associated with calories availability and dietary diversity at the household level (Sraboni, Malapit, Quisumbing, & Ahmed, 2014). Even though Sraboni and his colleagues looked at the multidimensionality of the

concept of women empowerment and its effect on dietary diversity at the household level, they failed to utilise an experience-based approach measure for food security. One limitation of the study is that, it fails to recognise the fact that there exist inter household variations as far as food security is concerned and how varying perspective of women empowerment can help mitigate this negative effect. This anomaly is addressed in objective three of this current study.

Banyen and Kotin (2015) conducted a study in Ghana to investigate how Non-governmental Organisations (NGOs) help in empowering women in Ghana through agricultural activities and how it can affect the productivity of food in the country. Using primary data from a field survey involving 220 respondents, including women who have never participated in NGO empowerment programmes in Nadowli District in Upper West Region of Ghana, the result from the study showed that, women who were engaged in NGO empowerment programmes were more likely to go into large scale farming, able to own their own farms and hire labour for farming than their counterparts who have never participated in such programmes. From the study findings, it was revealed that empowered women were more likely to increase their food production thereby reducing food insecurity in their households. The study, therefore recommended the need for women empowerment in ensuring household food security. One of the limitations of this study is that, it failed to capture how varying perspective of inter-household women empowerment affect household food security. Objective three of this current study addresses such anomaly.

Tsiboe et al. (2018) examined the effect of women's empowerment in agriculture on household nutrition. Using Instrumental variable estimation technique on a sample size of 2642 households in northern Ghana, the results from the study indicate that women empowerment positively influences nutrient availability. The study underscored the role of women empowerment in improving the food security status at the household level. In spite of the significant contribution of the study, it fails to recognise inter-household variations of women empowerment and how these variations affect household food security in the northern Ghana. Also, whether, there exist differences in endowments and whether these differences contribute to household food insecurity was not addressed by this study.

Sharaunga et al. (2016) sought to determine the dimension of women empowerment in agriculture necessary for reducing household vulnerability to food insecurity based on cross-section data collected from 300 randomly selected primary female heads of households in Msinga rural areas of KwaZulu-Natal. The study found that empowering women in socio-cultural aspects that create hindrances in agriculture reduces the probability of their households being vulnerable to food insecurity. Other forms of women's empowerment, including economic agency and physical capital empowerment, were found to reduce the likelihood of a household being vulnerable to food insecurity (Sharaunga et al., 2016). Even though the study adopted a measure that made it possible to rank the severity of food insecurity at the household level, it failed to recognised the fact that women empowerment is multidimensional and hence a single measure may lead to invalid conclusions. In order to address such limitation, this current study

adopts three measures of women empowerment to know their effect on household food security and child health as seen in objective one and three.

Olumakaiye and Ajayi (2006) investigated the association that exists between educational status of women and the provision of food for members of the household. The data were collected from 220 randomly selected women in Osun State, Nigeria. Using basic frequency distributions and percentages as well as chi-squares for the analysis, the study showed that women educational attainment positively correlates with provision of food for household members. This suggests that women with higher education are likely to provide varieties of food, thereby increasing the household food security (Olumakaiye & Ajayi, 2006). Although the study took into consideration the effect of women's education, the authors failed to account for possible effects spousal level of education will have on the empowerment level of the woman. Also, the study failed to rank the severity of food insecurity that may exist among the sampled households.

Amugsi et al. (2016) examined the association between women's autonomy and women's achievement of higher dietary diversity in Ghana. Using Ghana Demographic and Health Survey dataset, a total of 2262 women aged 15-49 years were analysed. The logistic regression results from the study showed that women's autonomy, regarding household purchases was significantly associated with higher dietary diversity. Whiles women who had primary education were 1.6 times more likely to achieve higher dietary diversity. The study underscored the role of women decision making in improving household food security in Ghana. However, the study failed to rank the severity of food insecurity that may exist within households and how

women empowerment could help mitigate such negative effect. This is addressed in objective of this study

Choudhary and Parathasarathy (2007) sought to quantify women's contribution to household food security in two villages, Ashta and Umra, located in Nanded district of Maharashtra in the semi-arid zone of western India. A combination of participatory rural appraisal techniques and household surveys based on standardized questionnaire were used to gather information for the study. Fifteen percent and 10 percent of the population in Umra and Ashta respectively, were selected on the basis of stratified random sampling technique. The population was classified into the household categories of landless, small, medium, and large farmers. This landholding-based classification enabled an understanding of different mechanisms in which women from different economic status contribute to food security, given that land ownership is the main indicator of socio-economic status in rural areas. Households with land-holdings of six acres and above were categorised as large farmers, households having landholdings of 3.1 to six acres as medium farmers, and households with landholdings of 0.1 to three acres were considered as small farm households.

In addition, a separate category of female-headed households irrespective of the size of their landholdings, was also considered. The results from the study underscore the role of women in improving household food security, emphasising that women play a critical role in all the four pillars of food security in the household, ranging from availability, accessibility, utilization, and stability. The authors, therefore, advocated measures that will motivate women (Choudhary & Parthasarathy, 2007). The limitation of this

work is similar to that highlighted above. The limitation of this study is that, it failed to account for possible effects spousal level of education will have on the empowerment level of the woman. Also, it failed to rank the severity of food insecurity that may exist among the sampled households. In order not to repeat such limitation in the current study, objectives one and three.

Chapter Summary

As a complex issue, food security demands multiple theories and integrative methods to fully explain the concepts. As a major component for development, especially among developing countries, food security and child nutrition remain important insofar as persistent problems of hunger and malnutrition among children claim the lives of many. This chapter presented both the theoretical and empirical studies on women empowerment, food security, and child nutrition. Theories such as household bargaining models, Sen's capabilities theory as well as the social stratification theories were all reviewed to provide a theoretical basis for the work. The empirical review was done under two main thematic areas: (a) women empowerment and child nutritional status; and (b) women empowerment and food security. The review indicated how various authors have conceptualised women empowerment, food security, and child health by employing different methodologies. The gaps that were identified in these studies were highlighted, which will provide an opportunity for them to be addressed in this thesis.

CHAPTER FOUR

RESEARCH METHODS

Introduction

This study concentrates on women empowerment and how it influences the nutritional status of children and food security at the household level in the Ghanaian context. Specifically, the study focuses on three thematic issues: (a) women empowerment and nutritional status of children under the age of five; (b) women empowerment and food security in Ghana; and (c) women empowerment and food security in northern Ghana. The chapter is organised as follows. The next section presents an overview of the research paradigm followed by reasons justifying the adoption of quantitative approach to the study. The subsequent sections submit a description of the data sources employed for the study, hypotheses tested, models specified, and the estimation techniques employed for the study. The limitation of the research method as well as the chapter summary is also presented.

Research Paradigm

In order to understand how the world functions, paradigms are adopted to explain the functioning of the world. A paradigm is a reference point for the conduct of research, which is constitutive of a particular tradition based on assumptions, values, practices, and techniques and provides a systematic method of investigation (Guba & Lincoln, 1994; Jankowicz, 2005) as well as specifies the ontological, epistemological, and methodological basis underlying a field of study (Anaman, 2014).

Usually, two main paradigms guide researchers. These paradigms are the constructivism and positivism (Guba & Lincoln, 1994). Positivism is

based on facts gained through the collection of data (observations) and interpreted through the objective approach (Hovenkamp, 1990). This philosophy assumes that the researcher has no direct influence on the data observed and prevent any introduction of normative judgements (Friedman, 1953). It uses logical reasoning which derives hypothesis from theories (Crowther & Lancaster, 2012). The method used in this approach is specified by formulating a hypothesis and testing its reliability through empirical observation. That is to say that positivism adopts the scientific approach and relies on objectivity by employing facts of a given phenomenon to undertake a systematic process of analysis.

Constructivism, on the other hand, is basically a theory based on observation and scientific study about how people learn. It says that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences. When we encounter something new, we have to reconcile it with our previous ideas and experience, maybe changing what we believe or maybe discarding the new information as irrelevant. In any case, we are active creators of our own knowledge. To do this, we must ask questions, explore, and assess what we know. That is to say that constructivism seeks to build perceptions of human phenomena based on personal and social experience and hinges largely on qualitative methods as opposed to quantitative research (Guba & Lincoln, 1994). According to this paradigm, people resort to their own experiences to construct meaning for a given phenomenon. However, opposing to the positivist paradigm, qualitative methods of research have been noted as being idiosyncratic and experiential and prone to individual value judgements, which

could prevent objectivity (Friedman, 1953). The third paradigm used by researchers is the combination of positivist and constructivist used to gather a more detailed investigation which is made of both facts and personal values. This method, also known as the mixed method, employs both the qualitative and the quantitative approach to understanding the functioning of the world.

Justification of research design – A positivist approach

Over the years, economic analyses used by economists have been based on the positivist approach. However, the choice of the research design is based entirely on the problem and objectives set for the study. This research seeks to contribute to knowledge from an objective perspective to build academic knowledge on women empowerment, food security, and nutritional outcomes of children in the country and Sub-Saharan African region as a whole hence the choice of positivist approach. In order to achieve the objectives, set, nationally representative datasets is used for the analysis. Ghana Demographic and Health Survey data (GDHS) in 2014, Ghana Living Standard Survey dataset in 2017, as well as the two rounds of Feed the Future datasets in 2012 and 2015 are used for the analysis. Specifically, the focus on objectivity is illustrated through the hypotheses to be tested. The following paragraphs provide a justification for each of the three empirical chapters.

On children's nutritional status, the variables needed included height of these children in centimetres, weights in kilograms, as well as their ages in order to calculate the Z-scores for each nutritional group using the World Health Organisation's classification for children nutritional outcomes. The GDHS data provides information on these variables. Hence, the intent is to employ such data in estimating the first objective. The second empirical

analysis focuses on an objective indicator for measuring women empowerment and household food security status. An objective analysis will, therefore, require data capturing questions that measure food security status, which are collected through observational surveys. This information is provided in the seventh round of the Ghana Living Standard Survey (GLSS7). Another justification linked to the second empirical analysis is the issue of sample size. To achieve national representativeness, which will aid policy decisions, the sample size is pertinent and hence requires a data that is representative enough. This therefore informs the use of national accepted data set.

Given the gross disparity between the north and south of the country, the third objective seeks to analyze women empowerment and household food security in the northern part of the country. In order to achieve this objective, a panel data funded by USAID and Government of Ghana was used for the analysis. This data was used because it was specifically collected to gather information on women empowerment and food security, which is in line with the objective of the study. Even though there may be the possibility of some form of limitations to the choice of quantitative approach, the quantitative approach adopted is based on the earnestness of the investigation into women empowerment and child health outcomes and household food security as well as the presence of a secondary data, which contain rich information that allows for such vigorous analyses.

It should be noted that this study adopted this approach in the sense that, without the secondary data, a nationwide scope would have been unattainable for a study of this nature and a primary survey would also have

also restricted the scope of analysis due to financial and time constraints. The reasons for adopting quantitative design using secondary data is based on the problem statement, the purpose of the study, availability of national dataset for the household level analysis, and also the estimation techniques adopted for the study.

Description of data sources

Data sources employed for the study were based on the objectives of the research. The first objective of this study is to analyse the effect of women empowerment on child nutritional status, proxied height-for-age (stunting), and weight-for-age (underweight) using the Ghana Demographic and Health survey dataset in 2014. This is because it is the dataset that contains the variables of interest needed for the first chapter. The Round Seven of the Ghana Living Standard Survey (GLSS7) is used to analyse the second empirical chapter since its contains the variables needed to analyse household food security in Ghana and also it is the most recent nationally representative dataset and hence provides the basis for generalisation. However, since the focus of the third empirical chapter is to look at women empowerment and food security in the northern part of the country given that prevalence of hunger in the northern part of the country exceed that of the national average, there is the need to do a painstaking analysis in order to ascertain how women empowerment can help improve the situation at the Northern part of the country. In view of that, the two rounds of Ghana Feed the Future dataset for 2012 and 2015 were used to analyse the third objective of the study.

Ghana Demographic and Health Survey Dataset

The Ghana Demographic and Health Survey dataset (GDHS) is a nationally representative survey of women and men aged between 15-49 and 15-59 years respectively. It is the sixth in a series of population and health surveys that have been conducted in Ghana. The primary purpose was to generate consistent information on fertility, family planning, infant and child mortality, and maternal, child health and nutrition (GSS, 2014). In addition, the survey collected specialised data on malaria treatment, prevention, and prevalence among children age 6-59 months; blood pressure among adults; anaemia among women and children among others. This information is essential for making informed policy decisions and for planning, monitoring, and evaluating programmes related to health, in general, and reproductive health, in particular, at both the national and regional levels. Analysis of data collected in the 2014 GDHS provides updated estimates of basic demographic and health indicators needed for the study (GSS, 2014).

Data collection processes of GDHS

In all, three separate questionnaires were used for the GDHS, 2014: (a) household questionnaire, (b) woman's questionnaire, and (c) man's questionnaire. These questionnaires, which were based on standard Demographic and Health Survey (DHS) questionnaires, were adapted to reflect the population and health issues relevant to Ghana. Comments on the questionnaires were sought from various stakeholders representing government ministries and agencies, nongovernmental organisations, and international donors.

The household questionnaire was used to list all the members of and visitors to the household selected for the study. Basic demographic information on each person selected for the study was collected, including his or her age, sex, marital status, education, and relationship to the head of the household. The data on age and sex of household members obtained in the household questionnaire were used to identify women and men who were eligible for individual interviews. The household questionnaire also included questions on child education as well as the characteristics of the household's dwelling unit, such as source of water, type of toilet facilities, materials used for the floor of the dwelling unit, and ownership of various durable goods. The woman's questionnaire which contained most of the variables needed for the analysis of the first objective of the study contained information on the following topics:

1. Background characteristics (age, education, media exposure, etc.)
2. Birth history and child mortality
3. Maternal and child health
4. Women's work and husbands' background characteristics
5. Women's empowerment indicators, maternity leave, and bride wealth
6. Knowledge, attitudes, and behaviour related to other health issues among others (GSS, 2014).

Sampling design for GDHS

The 2014 GDHS sample was stratified and selected in two stages. Each region was stratified into urban and rural areas, yielding 20 sampling strata. Samples of enumeration areas (EAs) were selected independently in each stratum in two stages. Implicit stratification and proportional allocation were

achieved at each of the lower administrative levels by sorting the sampling frame within each sampling stratum before sample selection, according to administrative units in different levels and by using a probability proportional to size selection at the first stage of sampling. In the first stage, 427 EAs were selected with probability proportional to the EA size and with independent selection in each sampling stratum. The EA size is the number of residential households residing in the EA enumerated in the 2010 PHC. A household listing operation was carried out in all the selected EAs, and the resulting lists of households served as a sampling frame for the selection of households in the second stage. To minimize the task of household listing for EAs with more than 200 households, each large EA was segmented. Only one segment was selected for the survey with probability proportional to the segment size. Household listing was conducted only in the selected segments.

Therefore, a 2014 GDHS cluster is either an EA or a segment of an EA. In the second stage of selection, a fixed number of 30 households per cluster were selected with an equal probability systematic selection from the newly created household list. The survey interviewers visited and interviewed only the selected households. No replacements or changes of the selected households were allowed during data collection, in order to prevent bias. All women aged 15-49 who were usual members of the selected households or who spent the night before the survey in the selected households were eligible for the female survey. Based on the focus of the study and the variables of interest, a total of 1,616 of children below the age of five were selected from a total of 2,500 for this current study.

Data validity and reliability

It is a known fact that the validation of a secondary data is a way of ensuring the integrity and accuracy of a dataset. Validation ensures measurement validity of variables used for the analysis and appropriateness of the dataset while reliability also requires that the data is precise, where measured variables, all other things being equal, can be re-measured to produce the same results.

For the GDHS survey, the data was initially inspected by describing the variables to ensure that existing coding, which were formerly based on the conventions and purpose for which the data was collected, were valid for the research. All relevant variables needed for the analysis of the first objective in the data were independently examined and validated with the description in the codebook. Afterward, some variables were re-coded to align with the purpose of the study and to ensure accuracy and succinctness as well as cross examination for possible outliers that may bias the finding.

Ghana Living Standard Survey Round Seven

The main data source that was employed for analyzing objective two is the seventh round of the Ghana Living Standard Survey (GLSS7). The GLSS is a multipurpose household survey, collected by Ghana Statistical Service (GSS) to collect information on many different dimensions of living conditions, including education, health, employment, and household expenditure on food and non-food items. Seven rounds of data have been collected from 1987/88, with the most recent one in 2016/17. The questionnaires used for most of the rounds are almost identical, therefore making their results directly comparable, except for the first two rounds. The

GLSS collects sufficient information to estimate total consumption of each household. This covers consumption of both food and non-food items. Food and non-food consumption commodities may be explicitly purchased by households or acquired through other means (for example, as output of own production activities, payment for work done in the form of commodities, or transfers from other households). In addition to this, the GLSS7 contains questions on experience-based food security scale, making it an appropriate data for the analysis as far as the second objective is concerned.

Sampling procedure

In October 2016, sampling field data collection for GLSS7 commenced and lasted for 12 months. In all, 14,009 households were interviewed in 1,000 enumeration areas (EAs) or clusters selected across the country based on probability sampling. After selecting the EAs, a household listing operation was carried out in all the selected EAs. The household listing operation consists of visiting each of the 1,000 selected EAs to record all structures and households within the EAs with the addresses and the names of the heads of the households using computer assisted personal interview (CAPI). The listed households served as the sampling frame for the selection of 15 households in the second stage selection for the main survey using a systematic sampling method. The information contained in the GLSS7 and the specific objectives set for objective two of this study allow for the examination of the correlates of women empowerment and household food security in Ghana, using the experience-based measure of food security.

Data validity and reliability

The GSS has provided national data on living standards in the country since 1987. Over the years, Ghana Statistical Service has made various attempts to improve the quality of data generated during each round. These surveys are designed based on internationally accepted specifications and measurement for developing countries. This makes the data valid for nationwide analysis and generalisation. The data was initially inspected by describing the variables to ensure that existing coding, which were formerly based on the conventions and purpose for which the data was collected, were valid for the research. All relevant variables need for the analysis were independently examined and validated with the description in the codebook. Afterward, some variables were re-coded to align with the purpose of the study and to ensure accuracy and succinctness as well as cross-examination for possible outliers that may bias the finding.

Ghana Feed the Future Dataset

The Feed the Future (FTF) 2012 and 2015 population-based survey for northern Ghana was a USAID and Ghana initiative program that was done in the three Northern parts of Ghana, that is, Upper East, Upper West, Northern region as well as some selected districts in the Brong-Ahafo Region to improve household food security by measuring women's empowerment in agriculture. These areas were designated as a United States Agency for International Development (USAID) Feed the Future (FTF) Zone of Influence (ZOI). The sampling for the baseline (2012), which was the first round, followed a two-stage stratified design, where 20 households were drawn from the 230 enumeration areas in the ZOI (Maberry, Amanor-Boadu, Ross, &

Zereyesus, 2014; Zereyesus, Ross, Amanor-Boadu, & Dalton, 2014). Ghana has been designated as a priority country for the USG's FTF initiative. The initiative supports the growth of the agricultural sector and promotes good nutrition to attain its key goal, "to sustainably reduce global hunger and poverty by tackling their root causes and employing proven strategies for achieving large scale and lasting impact." This study concentrated on households jointly managed by the male and the female as against households managed by the male. USAID Ghana is also working closely with the local non-governmental organizations, private sector organizations, and international development partners to efficiently achieve the objectives of the Feed the Future Initiatives by avoiding duplications.

Sampling procedure

A two-stage probability sampling approach was used in drawing the survey sample. The first stage involved the selection of enumeration areas (EAs) in the 2010 Ghana census, using the probability proportional to size (PPS) method. The second stage used a systematic sampling approach to select households in each sampled EA. Given the effective sample size of 4,600 and the custom of drawing a sample of 20 households from each EA, a total of 230 EAs within the ZOI were drawn by GSS. To ensure the achievement of the minimum RING Zone households of 2,360, care was taken to have all the 118 RING Zone EAs in the sample of 230 EAs. METSS worked with GSS to develop a comprehensive listing of households with the location and name of household head in the selected EAs to overcome the absence of an existing list with location and household head name. ISSER then used a systematic sampling approach on this comprehensive list of households and household

head names to draw the second stage household sample. The eleven modules making up the survey instrument were designed to capture the requisite information necessary for the estimation of the baseline indicators (Malapit et al., 2014). 4,410 households were interviewed in the first-round while 4,297 households were followed in 2015. After going through consistency checks and based on objective three of the study and the variables of interest, a total of 3,768 sample size was used for the analysis of the third objective.

Data collection instrument

Using the CAPI approach to data collection, enumerators administered the questionnaire by reading the questions from a computer and entering responses directly into the computer. The interface tool used drop-down and button menus wherever possible to speed up enumeration but also provided space for entry of unspecified responses. In order to speed up the interview process and reduce risks of potential errors, identification details were preloaded for selected households onto each enumerator's computer. The CAPI program was also designed to have all the necessary logic flows so that appropriate responses could be completed.

Data analysis procedures

As highlighted in the literature review, the investigation into household food security status and child nutrition is conducted on a thematic basis in accordance with the three-themed focus of the study. While GDHS data was used for the first objective, the remaining two empirical analyses utilised the GLSS7 and the two rounds of FTF respectively. In all three investigations, the unit of analysis was the household. Here, a household is defined as a person or group of related or unrelated persons who live together in the same housing

unit, who acknowledge one adult male or female as the head of the household, who share the same housekeeping and cooking arrangements, and are considered as one unit. The following sections present data analysis procedures for each objective. Each empirical analysis is conducted via the following processes: the hypotheses, model specification, and estimation technique. Details of variable definitions, measurements, and a-priori expectations are provided in Appendix B. All analyses were conducted with the Stata econometric software package.

Women empowerment and child health outcomes

The first empirical analysis was designed to test two main hypotheses relating to women empowerment and child health outcomes:

1. Varying perspectives of women empowerment have a significant effect on the child's nutritional status at different point in its conditional distribution.
2. The joint effect of women empowerment and food security has significant effect on the child's nutritional status

Model specification

Based on knowledge gained from related theories and empirical findings, an econometric model was specified describing the function that relates factors influencing children's nutritional status. Child's height-for-age and weight-for-age were used as a proxy for child's nutritional status. For the first empirical chapter, the dependent variable is a continuous variable, which, in the normal circumstance, Ordinary Least Squares (OLS) could be used. However, given that the effect of behavioural responses to predictors (for example, women's empowerment) is likely to be different between

malnourished and overweight child, it is necessary to evaluate the consequences of various variables on child nutritional status on a different point in its conditional distribution and hence the use of quantile regression in estimating the first empirical chapter. Notwithstanding, the results of OLS are presented side by side to that of the quantile estimation for comparison. In addition, instrumental variable estimation was done to cater for the possibility of endogeneity between women empowerment and nutritional status of children. Thus, in all, three estimation techniques were employed in objective one to analyse the relationship between women empowerment and child health outcomes.

Quantile Regression Model

Quantile regression (QR) was developed by Koenker and Bassett in 1978 to complement and improve the traditional mean model. QR seeks to quantify the heterogenous effect of covariates through conditional quantiles of the dependent variable and then provides a detailed examination of the whole distribution of the outcome, therefore providing a better summary of centrality than the mean, more robust to outliers and more flexible because its distribution of the outcome does not need to be strictly specified as certain parametric assumptions (Huang, Zhang, Chen, & He, 2017; Koenker & Bassett Jr, 1978).

The different types of QR methods can be classified into two groups, namely, minimisation of weighted absolute deviations, which is a typical inferential method used in QR; and the minimisation of a laplace likelihood. The former is based on Koenker and Bassett's work which sought to estimate the conditional median and full range of other functions of quantile which

seeks to minimise asymmetrically weighted absolute residuals. Let q_i represent the outcome of interest and the resultant covariate vector for subject $_i(i = 1, \dots n)$, where y_i represents independent scalar observation of a continuous random variable with a common cumulative distribution function (CDF). The quantile model is specified as,

$$\min_{b \in R^N}[\sum_{i \in (i: q_i \geq X_I b)} \theta \, |q_i - x_i b| + \sum_{i \in (i: q_i < X_I b)} (1 - \theta)|q_i - x_i b| \dots \dots \dots \dots \dots (4)$$

Econometric model

Following the theoretical model in equation (3) and the QR model specified above in equation (4), the purpose of the first empirical chapter is to examine the effect of women empowerment (measured as: (a) years of schooling of mother/ years of schooling of father; (b) woman decision-making; (c) acceptance towards domestic violence) and food security on a different point in its conditional distribution for a child's height-for-age and weight-for-age in Ghana. It must be emphasised that it is difficult to identify variables that will exactly fit the model as explained above. Notwithstanding the challenges, a reduced form equation approach is used with the child nutritional status as a function of women empowerment indicators and household characteristics. *i* is used to denote the *ith* child (or a unique number) identifying a particular child) and *h* for the *hth* household (a household identification number) in a total sample at time *t* (year). We estimate q_{ih}, a nutritional status indicator (namely Z-score of height for-age or weight for-age) which is specified as:

$q_{ih} = q_{ih}$ (E_h, FS_h D_i, X_h, Z_h, H_h, Z,) ..... (5)

E_h represents women's empowerment variables. The variable, E_h, is the measure of women's empowerment and comprises our central independent variable. As explained, women's empowerment (E_h) is proxied by (a) the proportion of mother's years of schooling to father's years schooling ([schooling years of mother]/[schooling years of father]); (b) a dummy variable on whether the father (husband) is justified in hitting or beating the mother (wife) when the mother (wife) neglects her responsibility towards the child (1 for Yes,0 for No); (c) a dummy variable on whether the mother (wife) makes decision in the household (1 for Yes, 0 for No).

D_i represents a vector of characteristics of the *ith* child: either male or not (1 for male child, 0 for female); age of the child (measured as a continuous variable, from 0 to 59 months); squared of child age; and the birth order of the child; captured as a categorical variables, either the second, third, or fourth child. X_h is a vector of household specific variables, such as household characteristics and compositions, including, mother's age (measured as continuous variable from 15 years 45 years), mother's age squared, household size (measured as the number of household members in the households), mother's occupation (not working, manual job and service), and whether a household has access to a radio and a flush toilet. Z_h is a vector of variables capturing the social, environmental, or infrastructural factors specific to the *hth* household: time necessary for getting water (measured as a continuous variable); H_h is a policy variable that would affect child's health. Whether any member of the household to which a child belongs has access to a health insurance or a healthcare scheme? This is captured as a dummy variable (1= have access to health scheme and 0=don't have access to a health

scheme). Health insurance or a healthcare scheme is broadly defined to include government sponsored health insurance scheme or private medical insurance schemes. Z captures three ecological zones (captured as a categorical variable, Forest, Coastal and Savannah) to understand whether geographical location has any significant effect on the health of the child. FS_h captures the food security status of the households. It was calculated using the various food items consumed by the child in the household. It was then re-categorised into a dummy variable capturing whether the child in a particular household is food secured to see its effect on the nutritional status of the child. Details of the variables used for the objective one and their a priori expectations are presented in Appendix B1.

Z-scores of children (Anthropometry Indicators)

The anthropometry indicators (height-for-age and weight-for-age Z-scores) were used as a proxy for child nutritional status. The study followed the World Health Organization (WHO) 2006 measure for calculating the Z-scores of children under the age of five. The measure was developed based on children from different countries: India, Ghana, Norway, Oman, Brazil, and USA as reference group to capture racial and ethnic diversity (Imai, Annim, Gaiha, & Kulkarni, 2012). Z-scores are more commonly used by the international nutrition community because they offer two major advantages. First, using Z-scores allow us to identify a fixed point in the distributions of different indices and across different ages (Cogill, 2003). The Z-score (SD score) is defined as the difference between the value for an individual and the median value of the reference population for the same age or height, divided

by the standard deviation of the reference population. This can be written in equation form as

Z-score = $(X_i - X_{median})/\delta^x$ ... ... (6)

It is normally assumed that children with a Z-score below -3 are classified as "severely stunted," while those with a Z-score between -3 and -2 are "moderately stunted." In this study, however, we define children with Z-score below -4 as "acutely malnourished" in order to identify the determinants of acute malnourishment at the tail end of the distribution. The study uses the median value of each nutritional group for the value of θ in estimating the quantiles. This measure differs from the traditional use of 0.25 and 0.50 since these arbitrary values do not give a clear representation of the exact nutritional group. For instance, if it is found that 5 percent of children are severely malnourished, a θ value of 0.025 is used. Due to the likelihood of the error terms in each nutritional group to be heteroscedastic, a simultaneous quantile regression was estimated with a bootstrap estimate of asymptotic variance calculated with 1000 repetitions.

Instrumental Variables

Identifying a suitable instrument which satisfies all assumptions underlying the validity and reliability of the instrument is quite a challenging task since any robust estimate would be determined by the acceptability of the instrument (Cameron & Trivedi, 2005). A careful examination of the literature confirms the possibility of endogeneity shown by simultaneity bias between women empowerment and child health. For instance, household decision on the quality of health of the child can affect women empowerment. This is because an empowered woman is able to make to make informed decisions

regarding the health of the child. To be efficient, childcare policies must take into account the nature of the linkages between women empowerment and child health. Particularly, these linkages are bidirectional. Thus, childcare responsibilities are major obstacles impeding women's efforts to achieve empowerment and women's lack of empowerment has negative effect on the health of the child. Most studies done in Ghana have failed to take into these critical linkages into account and, thus, the opportunity is lost for achieving coherent programmes that aim to ensure mutually reinforcing, positive outcome for women empowerment and child development (UNICEF, 2015). Hence, this possibility is addressed econometrically.

Mother's years of schooling relative to the husband is instrumented by two variables: (a) the number of other wives in the household to make a case that, as the number of wives increases, it will reduce the bargaining power of the woman but may not necessarily affect the child's nutritional status; and (b) knowledge of and use of contraceptives by women (the reason behind this instrument is that a woman who has the power to decide whether or not to use contraceptive may be empowered but this does not necessarily affect the health of the child). The results of the test for validity of the instruments (Hansen, J Statics and Endogeneity test) as well as the final results of the IV estimate for height-for-age (stunting) and weight-for-age (underweight) are presented in Appendices C3, C4, and C5.

Where z is the instrument, and given that $E[Z_i, \varepsilon_i] = 0$ and all have finite variables, it follows that

$$plim\left(\frac{Z'\varepsilon}{n}\right) = plim\left(\frac{Z'y}{n}\right)\ plim(Z'X\beta)0 \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Therefore

$$plim\left(\frac{Z'y}{n}\right) = \left[plim\left(\frac{Z'x}{n}\right)\right]\beta +$$

$$plim\left(\frac{Z'\varepsilon}{n}\right)\left[plim\left(\frac{Z'x}{n}\right)\right]\beta \text{.....} \quad (8)$$

Supposing that z has the same number of variables as x, that is, mother's education relative to that of the father has the same number of variables as the instruments used, $x_t = [1, y_t]$ when $z_t = [1, y_{t-1}]$, we assume that the rank of $z'x$ is K, so now $z'x$ is a square matrix. It follows that $[plim\left(\frac{Z'x}{n}\right)]^{-1}\ plim\left(\frac{Z'y}{n}\right) = \beta$, which leads us to the instrumental variable estimator

$$b_{IV} = (z'x)^{-1}z'y \text{.....} \quad (9)$$

Women Empowerment and Household Food Security in Ghana

The second empirical analysis tested whether women empowerment has a significant effect on household food security. The generalized ordered logit, which utilizes the maximum likelihood technique was used to analyze the first hypothesis for the second chapter. As an ordinal regression, it helps to determine the effect of women empowerment on each of the levels of food security status of the household. In addition to the generalized ordered logit, margins capturing varying levels of women empowerment and its effect on each of the levels of food security were also estimated. For policy recommendation purposes, dominant analysis was done to capture the most dominant women's empowerment variable needed to improve the state of food security at the household level.

Hypotheses

1. The probability of a household becoming food secure increases as women empowerment increases
2. Varying perspectives of women empowerment have a significant effect on food security in the household.

Generalized ordered logit model

Estimation techniques such as Ordinary Least Squares (OLS) Regression normally require that outcome variables have an interval and ratio level measurement. However, in instances where the outcome variable is ordered, OLS regression becomes inappropriate for estimating such models. The most popular model normally used in such situations is the ordered logit model, also known as the proportional odds assumption model (Boes & Winkelmann, 2004; Williams, 2016). Unfortunately, basic assumptions of the ordered logit model have been frequently violated and this has led researchers to make a choice between using a method whose assumptions are known to be violated or adopting a method that is less parsimonious and more difficult to interpret, such as a multinomial logit model which makes no use of the information on the ordering categories (Long & Freese, 2001, 2006; Williams, 2016). According to Williams, if estimating an equation where the dependent variable is ordinal, the best estimation technique to use is the Generalized Ordered Logit Model (GOLM) because it is more parsimonious, provides a better fit for data, and satisfies the proportional odds assumptions, which is mostly violated when ordered logic is used (Williams, 2016). Aside these advantages, GOLM help estimate models that are less restrictive than ordered logit and whose assumptions are mostly violated. Under GOLM, the issue of

proportional odds assumptions are satisfied and no variable need to meet this assumption (Williams, 2006).

The parallel regression assumption results from assuming the same coefficient vector β for all comparisons in the $j-1$ equations

$$ln\Omega \leq m| > m\ (X) = T_m\ - X\beta \quad \text{..... (10)}$$

Where

$$ln\Omega \leq m| > m\ (X) = \frac{p_r\ (y \leq m|X)}{p_r\ (y > m|X} \quad \text{.....(11)}$$

The GOLM allows β to differ for each of the $j-1$ comparisons. That is

$$ln\Omega \leq m| > m\ (X) = T_m\ - X\beta \quad \text{for } j = 1\ to\ j-1 \text{..... (12)}$$

where predicted probabilities are computed as

$$p_r(y = 1|X) = \frac{\exp(T_1 - X\beta_1)}{1+\exp(T_1 - X\beta_1)} \text{ ..... (13)}$$

$$p_r(y = j|X) = \frac{\exp(T_j - X\beta_j)}{1+\exp(T_j - X\beta_j)} - \frac{\exp(T_{j-1} - X\beta_{j-1})}{1+\exp(T_{j-1} - X\beta_{j-1})} \quad for = 2\ to\ j-1 \text{ .....(14)}$$

$$p_r(y = j|X) = 1 - \frac{\exp(T_{j-1} - X\beta_{j-1})}{1+\exp(T_{j-1} - X\beta_{j-1})} \text{ ..... (15)}$$

To insure that the $p_r(y = j|X)$ is between 0 and 1, the $(T_J - X\beta_j) \geq T_{j-1} - X\beta_{j-1})$ must hold (Long & Freese, 2006). Thus, GOLM can be written as

$$P(Y_I > J) = g(X\beta_J) = \frac{\exp(a_j + X_i\beta_j)}{1+[\exp(a_j + X_i\beta_j)]},\ J = 1,\ 2 \ldots, M-1 \text{ ..... (16)}$$

For instance, if the outcome variable has four possible values, the GOLM will have three sets of coefficients; in effect, three equations are estimated simultaneously. An unconstrained GOLM gives results that are similar to what we get with the series of binary logistic regressions or cumulative logit models (Williams, 2016). For an ordinal outcome variable

with M categories, GOLM is written as Equation (16) above. For example, if the outcome variable has four possible values, the GOLM will have three sets of coefficients; in effect, three equations are estimated simultaneously. An unconstrained GOLM gives results that are similar to what we get with the series of binary logistic regressions or cumulative logit models. The ordered logit model is a special case of the GOLM where the betas are the same for each j; that is, the j subscripts are unnecessary in the above formula. In between these two extremes is the partial proportional odds model (PPO). With the PPO, some of the beta coefficients are the same for all values of j, while others can differ. For example, in the following PPO model the betas for X1 and X2 are constrained to be the same across values of J but the betas for X3 are not:

$$P(Y_I > J) = g(X\beta_J) = \frac{\exp(a_j + X1_i\beta 1 + X2_I\beta 2 + X3_i\,\beta 3_j)}{1+[\exp(a_j + X1_i\beta 1 + X2_i\,\beta 2 + X3_i\,\beta 3_j]}, J1,\ 2 \ldots, M - \ldots \text{ (16a)}$$

An unconstrained GOLM and a multinomial logit model will both generate many more parameters than an ordered logit model does. This is because, with these methods, all variables are freed from the proportional odds constraint. (Williams, 2016).

Econometric model for Generalized Ordered Logit

Using the food insecurity experience scale as a proxy for measuring food security, which is able to rank the severity of food insecurity and also known to be a direct measure of food security (Ballard et al., 2016; FAO, 2014; Nord, 2014), as well as other household variables, and following Williams (2016), the empirical model is specified as

$$FS=\beta_0+\beta_1 E_h+\beta_2 A_h+\beta_3 V_h+\beta_4 F_i+\beta_5 G_i+\beta_6 H_i+\beta_7 NF_i+\beta_8 W_i+\beta_9 Z+\beta_{10} D+\varepsilon \ldots\ldots \text{ (17)}$$

where FS; 1=mild or no hunger;

2= moderately food insecure

3= severely food insecure

β_0 = Intercept

E_h=Education empowerment/ Relative years of schooling

A_h=Women decision making

V_h=Domestic Violence

F_i=Any household member engaged in farming activities

G_i=Age of household head

H_i=Household size

NF_i=Household expenditure on non-food items

W_i=Household expenditure on water

Z_i=Ecological zones

D_i= Any household member with disability

Women empowerment measure by relative years of schooling of mother/ partner is expected to have a positive effect or improve household food security. Hence, we expect that, an improvement on relative education should lead to a reduction in moderate to severe hunger at the household. The same effect is expected if women empowerment is proxied by decision making. On the other hand, we expect a negative effect of domestic violence on household food security. Household engagement in agriculture activity is expected to reduce the state of food insecurity at the household level whiles household expenditure on non-food items is also expected to have a negative effect on food security. Presence of disabled people in the household is expected to have a negative effect on the state of food security at the household level.

Details of all the other explanatory variables, measurements, and a priori expectations for each of the variables are presented in Appendix B2.

In order to understand and appreciate the dynamics at the household levels, margins were used to predict the various levels of women empowerment and the probability of a household to belong to a particular category of food security status. Marginal effect is the partial derivative of y with respect to x. For the nonlinear models, the value of the marginal effect depends on the specific values of all of the independent variables (Long & Freese, 2006).

Dominance Analysis

In order to identify the relative importance of the main variables of interest (women empowerment indicators) to the dependent variable, dominant analysis was used. Budescue (1993) detailed the procedure for conducting a dominance analysis. Dominance analysis produces general dominance weights that are computed by finding the average of a given predictor's incremental validity across all possible submodels that involve that predictor. The incremental validity of predictor *i* in a submodel is defined by

$$\Delta R_{in}^2 = r_{y.xixh}^2 - r_{y.xh}^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 18$$

where x and y in the equation represent independent and dependent variables respectively, while xh represents one unique subset of *k* predictors in the submodel and x_i represents the $k+1$th variable added to the submodel. The average incremental validity for predictor x_i contained in all submodels of size *k* is

$$C_{xi}^k = \sum_{k=1}^{p-1} {}^k \Delta R_{ih}^2 \; / \; {}_k^{p-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 19$$

where ΔR_{ih}^2 is as defined in equation 19, *h* is one unique subset of *k* predictors, and $\binom{p-1}{k}$ is the combination function equal to $p!/[k!(p-1-k)!]$, which is the number of subsets of size *k* that can be formed from $(p-1)$ predictors.

$$C_x = \sum_{k=1}^{p-1} {}_k C_{xi}^{(k)} / (p-1) \quad \text{.....(20)}$$

General dominance weights have two main inviting properties. First, each general dominance weight is the average contribution of a predictor to a criterion, both on its own and when taking all other predictors in the model into account. Second, general dominance weights across predictors always sum to the overall model R^2 (Budescu, 1993).

Women Empowerment and Food Security in Northern Ghana

The third empirical chapter investigates whether there exist differences in the state of food security between male-headed and female-headed households and the sources of these differences with particular focus on northern Ghana (Northern, Upper East, and Upper West Regions and some selected districts in the Brong Ahafo Region) due to the high rate of prevalence of hunger in these regions. For the third empirical chapter, the dependent variable is dummy, capturing whether the household experiences moderate to severe food insecurity or it does not experience any form of hunger (food secured). Therefore, to determine the effect of women empowerment on the dependent variable, some of the control variables used included age of household head, gender of household head, and household size. This section presents the hypothesis and the empirical models used in testing the hypothesis set.

Hypotheses

i. The probability of a household becoming vulnerable to food insecurity in northern Ghana decreases as women's empowerment increases.

ii. The probability of female-headed household being vulnerable to food insecurity in northern Ghana is attributed to differences in endowments

Panel Model

Given that the third hypothesis seeks to investigate the effect of women empowerment on household food security in the northern part of the country using the two rounds of Feed the Future (FTF, 2012 and 2015) population-based survey dataset, a panel model was specified. The relative advantage that a panel model has over a cross-sectional model is well known because it provides more sophisticated analysis (Bollen & Brand, 2010). The two most common models that can be estimated using panel is the random effect and fixed effect models (Guo & Hipp, 2004; Zeger & Liang, 1986). A major attraction of these models is that they provide a way to control for all time invariant unmeasured variables that influence the dependent variable. The Random Effect Model (REM) assumes that omitted latent variables are not correlated with time-varying covariates while the Fixed Effect Model (FEM) allows these variables to freely correlate (Mundlak, 1978). The REM has the advantage of greater efficiency relative to the FEM, leading to smaller standard errors of coefficients and higher statistical power to detect effects (Bollen & Brand, 2010; Hsiao, 2014). A Hausman test after estimating REM and FEM enables the researcher to distinguish between which model best fits

the data. Hence, based on the Hausman test results which is represented in Appendix E, Table 9, the REM was chosen over the FEM.

Random effect model

REM is one of the most popular models for panel data. It assumes that all the explanatory variables have effects on the dependent variables that are the same over all time periods. Econometrically, the REM is specified as

$$y_{it} = \beta_0 + X'_{it}\beta + (\alpha_i + v_{it}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (21)$$

Following the model above, the empirical model was specified as

$$fs = \beta_0 + \beta_1 YearsSchooling_{it} + \beta_2 Autonomy_{it} + \beta_3 MaleHeaded_{it} + \beta_4 QRural_{it} + \beta_5 Waterpresence + \beta_6 Land + \beta_7 Reg + \beta_9 Groupmem_{it} + \beta_{10} Age_{it} + \beta_{11} CookingF + \beta_{12} hhsize + \beta_{13} EngageFarm_{it} + \beta_{14} SelfOwn_{it} + \mu_i + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (22)$$

From Equation 22, women empowerment proxied by years of schooling of wife/partner is expected to have a negative effect on moderate to severe food insecurity at the household level. This is because, it is expected that an educated woman will be more enlightened on nutrition and food related issues and hence stands a better chance of educating household members on measures to employ to ensure food security. Autonomy, measured as women decision making is also expected to have a negative effect on moderate to severe hunger at the household level. Women are primary care givers at the household level, responsible for cooking arrangement. Hence, if women are given the opportunity to make decisions in the households, they will be in the best position to ensure that the household is safe from hunger. On the other hand, we expect that male headed households are more likely to have better

food security status than their male counterparts. Rural areas are expected to be more food insecure than their counterparts in the urban area. It is expected that, a household where the mother or wife is a member of a social club or belongs to an association, stands a higher chance of having a household with improved food security status. Households that are engaged in farming or has access to land are expected to have improved food security status compared to other households that does not have access to land or engaged in any form of agricultural activities. The definitions of the variables and their a priori expectations are presented in Appendix B3.

Generalized estimating equations

In addition to the REM, Generalized Estimating Equations (GEE) were done to check the consistency of the results between different models. GEE was developed by Liang and Zeger in 1986 as a means of testing hypotheses regarding the influence of factors on binary and other exponential variables. It is an extended version of the Generalized Linear Models, which facilitates regression analysis on dependent variables which may not necessarily be normally distributed (Ballinger, 2004; McCullaugh & Nelder, 1989; Ziegler, Kastner, & Blettner, 1998). However, GEE estimates regression coefficients and standard errors with sampling distributions that are asymptotically normal. GEE starts with maximum-likelihood estimation of the regression parameters (β) and the variance calculated using a link function, which is a transformation function that allows the dependent variable to be expressed as a vector of parameter estimates (Ballinger, 2004; McCullaugh & Nelder, 1989; Rotnitzky & Jewell, 1990; Zeger & Liang, 1986). A second step involves specifying the distribution of the outcome variable so that the variance might be calculated as

a function of the mean response (Hardin & Hilbe, 2012). If the data used is correlated within cluster over time, an autoregressive correlation structure is specified to set the within-subject correlations as an exponential function of this lag period, which is determined by the user. Users may specify that the within-subject observations are equally correlated, which is referred to as an "exchangeable" correlation structure, an exchangeable correlation matrix can be used (Horton & Lipsitz, 1999). The GEE model can be specified as

$$U(\beta) = \sum_{i=1}^{K} \frac{\partial u_i}{\partial \beta} V^{-1} \{Y_i - u_i\ (\beta)\}=0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(23)}$$

Following the model above, the econometric model for GEE is specified as

$$fs = \beta_0 + \beta_1 YearsSchooling_{it} + \beta_2 Autonomy_i + \beta_3 MaleHeaded_i + \beta_4 QRural_i + \beta_5 Waterpresence + \beta_6 Land + \beta_7 Reg + \beta_9 Groupmem_i + \beta_{10} Age_i + \beta_{11} CookingF + \beta_{12} hhsize + \beta_{13} EngageFarm_i + \beta_{14} SelfOwn_i + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(24)}$$

Multivariate decomposition for nonlinear model

In addition to the GEE and the REM, multivariate decomposition for non-linear models is used to determine whether there exist differences in food security between male-headed and female-headed households in the northern part of the country and, if there is, the source of these differences. Multivariate decomposition for non-linear model is widely used in research to quantify the contributions to group differences in average predictions from multivariate models.

The technique uses the output from regression models to divide the components of a group difference in a statistic, such as a mean or proportion, into a component attributable to compositional differences between groups (that is, differences in characteristics or endowments) and a component

attributable to differences in the effects of characteristics (that is, differences in the returns, coefficients, or behavioral responses) (Powers, Yoshioka, & Yun, 2011). These techniques are equally applicable for partitioning change over time into components attributable to changing effects and changing composition. The model is specified as

$$\overline{Y_A} - \overline{Y_B} = F(\overline{X_A}\beta_A) - F(\overline{X_B}\beta_B) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (24)$$

$$\overline{Y_A} - \overline{Y_B} \quad = F(\overline{X_A}\beta_A) - F\left(\overline{X_B\,\beta_A}\right) + F(\overline{X_B}\,\beta_A) - F(\overline{X_B}\beta_B) \ldots\ldots\ldots (25)$$

Endowment Coefficient

The C component refers to the part of the differential attributable to differences in coefficients or effects, usually called the unexplained component or coefficients effects, and E reflects a counterfactual comparison of the difference in outcomes from group A's perspective (that is, the expected difference if group A were given group B's distribution of covariates) (Powers et al., 2011; Yun, 2004). The Endowment component represents all observable characteristics that make men perform better than women or women perform worse than the men.

Post-estimation test interpretations

Model specification tests are conducted using a variety of methods. Examples are the Wald, Likelihood Ratio (LR), Lagrange Multiplier (LM), Hosmer-Lemeshow and the Link test (Cameron & Trivedi, 2010; Long & Freese, 2014; Stock & Watson, 2007; Wooldridge, 2010). Measures in the probit and logit regression output provide results on the fit of the model. These include, the log likelihood and the likelihood ratio test. An accompanying p-value provides a test for the joint significance of all regressors. According to

Long and Freese (2014), the output provides results of the Wald test when robust standard errors are applied.

Another measure of fit applicable to non-linear models is the McFadden's R^2 measure, commonly known as the Pseudo-R^2. Although, ideal for binary outcome models, the Pseudo-R^2 does not directly replicate the R^2 of the linear model. Hence, it is not a measure of the proportion of variation of the outcome variable explained by the model (Long & Freese, 2014). Similar to the R^2 for cross-sectional studies, the McFadden R^2 statistics tend to be low.

The Hosmer-Lemeshow test also provides a test for specification where the null suggests that the model is correctly specified (Cameron & Trivedi, 2010). Therefore, the accompanying p-value should be large enough to result in a failure to reject the null hypothesis. Although the test statistic is widely used for assessing model fit, a caveat is drawn regarding a complete reliance on this measure, since it uses predicted probabilities based on an arbitrary decision on the number of sub-groups used in the test. Without any such specification, the test defaults to a value of 10 subgroups (Cameron & Trivedi, 2010; Long & Freese, 2014). For the specification tests, the study uses the Wald test of the regression output, the linktest and the Hosmer-Lemeshow tests.

Instrumental variables post-estimation technique is normally conducted to ascertain whether instruments created by the identification by are identified. The null hypothesis states that the equation is under-identified. A significant p-value means that the null hypothesis is rejected in favour of the alternative hypothesis that the equation is exactly identified. The Sargan-Hansen test is a test of overidentifying restrictions. The joint null hypothesis tests that the

generated instruments are valid (uncorrelated with the error term), and that the excluded instruments are correctly excluded from the estimated equation. Under the null, the test statistic is distributed as chi-squared in the number of (L-K) overidentifying restrictions. A rejection casts doubt on the validity of the instruments.

Weak identification arises when the excluded instruments are correlated with the endogenous regressors, but only weakly (Stock & Yogo, 2005). Estimators can perform poorly when instruments are weak. For an equation to be robustly identified, excluded instruments should not only be correlated with endogenous regressors but the correlation should be strong. In the presence of weak instruments, IV estimators are likely to be biased and can produce large distortions.

Hausman test for comparing Random and Fixed Effect estimators assumes that Since the key consideration in choosing between a Random Effects (RE) and Fixed Effects (FE) approach is whether C_I and X_{it} are correlated, it is important to have a method for testing this assumption. Hausman (1978) proposed a test based on the difference between the RE and FE estimates. Since FE is consistent when C_I and X_{it} are correlated, but RE is inconsistent, a statistically significant difference is interpreted as evidence against the RE assumption.

Chapter Summary

The methodological choices of the study were provided in this chapter. The chapter provided the justification for choosing a quantitative analysis for the study and a detailed presentation of all the estimation techniques employed in each of the objectives set for the study. Quantile regression estimation

technique was adopted based on the fact that the interest is to evaluate the women empowerment on different categories of child health. GOLM was also chosen over the ordered logit for the second empirical chapter based on its superiority in terms of meeting underlying assumptions which are mostly violated in ordered logit models. The third empirical analysis adopted a new technique used to decompose non-linear dependent variables. The next chapter presents the results and discussion of the first empirical analysis, which focused on women empowerment and nutritional status of children under the age of five.

CHAPTER FIVE

WOMEN EMPOWERMENT AND CHILD'S NUTRITIONAL STATUS IN GHANA

Introduction

This chapter presents the results and discussion of the first empirical analysis which investigates issues on women empowerment and nutritional status of children under the age of five. Two main hypotheses are tested: (a) Varying perspectives of women empowerment have significant effects on child's nutritional status at different points in its conditional distribution, and (b) The joint effect of women empowerment and food security has a significant effect on child's nutritional status.

The study employs multiple estimation techniques (QR, OLS and IV) to investigate the issues under consideration. The next section of this chapter provides the descriptive statistics of the variables used in the estimation, followed by the discussion of the results from the estimations. The final section provides a summary of the chapter.

Descriptive Statistics

The descriptive statistics in Table 1 provides summary statistics of the continuous variables. The nutritional status of children is captured using the child's height-for-age (stunting) and weight-for-age (underweight) Z-scores in conformity with WHO's classification for child health, as explained in detail in Chapter Four. From Table 1, it can be seen that the minimum scores for children's height-for-age and weight-for-age is -5.94 and -5.28 respectively. These values are consistent and true reflections of height-for-age and weight-for-age Z-scores generated in the GDHS, 2014 report, which permits the

measurement and evaluation of child's nutritional status in Ghana. Children with height-for-age Z-score below minus two standard deviations (-2 SD) from the median of the reference population are considered short for their age (stunted) or chronically malnourished.

Similarly, children with Z-scores below minus three standard deviations (-3 SD) are considered severely stunted. Height-for-age Z-scores which measure stunting reflects failure to receive adequate nutrition over a long period and is also affected by recurrent and chronic illness, hence, represents the long-term effects of malnutrition (specifically, undernutrition). Weight-for-age, on the other hand, is a composite index of height-for-age and weight-for-height. It takes into account both acute and chronic malnutrition. Children with weight-for-age Z-scores below -2 standard deviation from the median of the reference population are classified as underweight. Thus, a Z-score of less than 0, either for stunting or underweight, suggests that those children are less nourished. Table 1 also shows that at least some households in Ghana spend about 18 minutes to get access to water for household consumption and a minimum household size of 3. Mean of age of the children under consideration is 2 years and a maximum of 4.

Table 1: Summary statistics for continuous variables

Variable	Mean	Std. Dev.	Min	Max
Height-for-age Z score	-1.004856	1.260019	-5.94	5.03
Weight-for-age Z score	-.7718355	1.052601	-5.28	3.44
Relative years of schooling	1.182682	1.52846	.0625	10
Average years of schooling	5.403008	4.373893	0	17.5
Age of child	1.90178	1.40425	0	4
Household size	5.976059	2.588728	3	21
Age of mother	31.03929	6.581071	16	49
Time to water source	17.96228	19.06741	0	180
N=1,616				

Source: Author's construct (2019)

Figure 10 below suggests that there is statistically significant dependency between violence and decision-making at 1 percent level of significance (p value < 0.01). It can be seen that 76 percent of women who do not have positive acceptance towards domestic violence are allowed to make decisions. This suggests that, in households where there is no form of domestic violence, there is the tendency for the improvement of women empowerment in the form of decision-making.

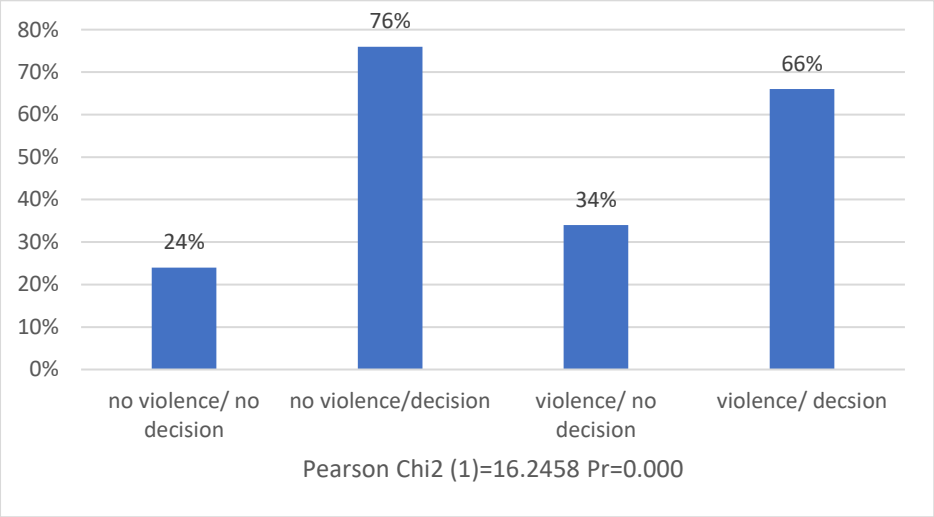

Figure 10: Mother's decision making and acceptance towards domestic violence

Source: Author's construct (2019)

Table 2: Acutely malnourished by food security grouping

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Not food secure	1,438	.0125174	.0029329	.1112174	.0067642	.0182706
Food secure	175	.0285714	.0126298	.1670767	.0036441	.0534988
Combined	1,613	.0142591	.0029529	.118594	.0084673	.020051
Diff		-.016054	.0094892		-.0346666	.0025585

diff = mean (Not food secure) – mean (Food secure) t = -1.6918
Ho: diff = 0 degrees of freedom = 1611
Ha: diff < 0 Ha: diff ≠ 0 Ha: diff > 0
Pr(T < t) = 0.0454 Pr(|T| > |t|) = 0.0909 Pr(T > t) = 0.9546.
Source: Author's construct (2019)

The one tail test in Table 2 indicates that the difference between the mean acutely malnourished score of households with children who are food secured and those who are not food secured is statistically significantly less than zero at five percent significant level ($p<0.05$). This suggests that the mean value of acutely malnourished score of households with children who are food secured (0.0285714) is higher than those who are not food secured (0.0125174). Based on the scale used, it is concluded that, on average, children in households which are not food secure have a higher tendency of being acutely malnourished than their counterparts in food secured household.

Effect of women empowerment on nutritional status of children

This section discusses results generated from the estimations for the first objective. Table 3 provides results on the stepwise regression for both height-for-age and weight-for-age. The full models capturing OLS estimation and QR are presented in Table 4 and Table 5 respectively. The results of the IV test are also presented in Appendix C1 and C2. The next section discusses the results by focusing on the variables used and how each influences child health, using the various estimation techniques.

Women empowerment variables

The ensuing paragraph discusses the measures used for measuring women empowerment. Three measures are used to capture women empowerment: (a) mother's years of schooling relative to the father of the child, (b) mother's decision-making regarding the health of child, and (c) acceptance towards domestic violence. Mother's years of schooling relative to the partner is a continuous variable indicating that the higher the value, the better the bargaining power of the mother in the household, which is expected

to translate into making choices in favour of the child. Decision-making of the mother is a dummy variable (1=mother makes decision, 0 = mother does not make decision) to capture the level of autonomy the mother has in making decision regarding the health of the child without any form of restrictions. Acceptance towards domestic violence, captured as whether beating is justified if the mother neglects her responsibilities towards the child, is also captured as a dummy variable (1=beating justified, 0= beating not justified). This measures the lack of empowerment indicating that if there is the presence of domestic violence, then the mother is not empowered; however, if she does not experience any form of abuse in the household, then her empowerment level improves. This is because presence of domestic violence against women in the household limits their bargaining power. The results of these three empowerment variables on child's nutritional status are discussed in the next paragraphs, followed by other covariates used in the estimations.

Mother's years of schooling relative to the partner

The results for mother's years of schooling relative to that of the father differ from the OLS, IV, and QR estimations. The QR shows the various categories of child health from acutely malnourished child to an overweight child. In as much as it helps us to understand the effect of women empowerment on the various categories of child health, it also provides the platform to understand the determinants of child health. From the Z-scores categorisation, we expect a positive value for relative years of schooling from acutely malnourished child through to normal and a negative value for overweight child. For instance, a positive value of relative years of schooling

for acutely malnourished child means that the child stands a higher chance of experiencing a better health status if her mother is educationally empowered.

Even though mother's years of schooling relative to that of the father was not statistically significant in explaining the nutritional status of children for the full models of OLS and IV, the QR results suggest important differences at different points in the conditional distribution of height-for-age (stunting) and weight-for-age (underweight). Thus, a child whose mother is relatively better educated tends to have a better nutritional status in some cases. For instance, Table 3 shows that relative years of schooling is significant and negative for an overweight child for height-for-age at 10 percent (p value< 0.1) significant level. This means that a child whose mother is relatively better educated tends to have better nutritional status, thus reducing the level of overweight of such a child while it is positive and significant for acutely malnourished child for weight-for-age, indicating a better chance of moving from a worse state to a better nutritional status. This finding supports the bargaining theory model. This is because, given the fact that mothers place a higher premium on the health of the child, women empowerment will lead to improvement in the health status of children under-five in the household.

Table 3: Stepwise regression of empowerment on stunting and underweight

	OLS	QUANTITLE						
Variables	**Height-for-age (Stunting)**	**Acutely Malnourished**	**Severely Malnourished**	**Moderately Malnourished**		**Normal**		**Over-weight**
Relative years of schooling	-0.0237	0.00232	-0.0400	0.00600	0.00833	-0.00522	-0.0246	-0.0272	-0.0292*
	(0.0200)	(0.0639)	(0.0541)	(0.0616)	(0.0226)	(0.0264)	(0.0197)	(0.0170)	(0.0170)
Decision on child health	0.232***	-0.0421	0.280	0.340**	0.320***	0.325***	0.258**	0.240**	0.236**
	(0.0763)	(0.336)	(0.230)	(0.138)	(0.0935)	(0.0874)	(0.110)	(0.0939)	(0.0922)
Acceptance towards domestic violence	-0.212***	0.539	-0.170	-0.320**	-0.257***	-0.197**	-0.177**	-0.187**	-0.204***
	(0.0734)	(0.372)	(0.205)	(0.125)	(0.0883)	(0.0948)	(0.0845)	(0.0757)	(0.0751)
Food secured	0.573**	-1.735	1.263	0.353	1.082***	1.102***	0.842***	0.912***	0.889***
	(0.229)	(1.743)	(1.580)	(0.883)	(0.381)	(0.215)	(0.214)	(0.205)	(0.205)
Food secured and education empowerment	-0.00465	-0.333	0.0975	0.0273	-0.0824	-0.0859	-0.0125	-0.0215	-0.0194
	(0.0697)	(0.339)	(0.278)	(0.231)	(0.0730)	(0.0850)	(0.0902)	(0.0905)	(0.0909)
Food secured but positive attitude towards violence	-0.464**	0.0728	-2.580*	-0.640	-0.307	-0.535*	-0.251	-0.387	-0.371
	(0.216)	(1.543)	(1.368)	(0.694)	(0.281)	(0.301)	(0.301)	(0.281)	(0.280)
food secured but no autonomy	-0.329	2.177	0.810	-0.0500	-0.736**	-0.801***	-0.679**	-0.554**	-0.550**
	(0.229)	(1.680)	(1.426)	(0.783)	(0.372)	(0.272)	(0.275)	(0.257)	(0.256)
Constant	-1.100***	-4.770***	-3.680***	-2.746***	-2.018***	-1.520***	-1.209***	-1.136***	-1.113***
	(0.0734)	(0.331)	(0.243)	(0.140)	(0.0868)	(0.0844)	(0.110)	(0.0893)	(0.0871)
Observations	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630	1,630

Table 3 Cont'D

	Weight-for-age (Underweight)								
Relative years of schooling	-0.00218	0.163*	-0.0124	-0.0100	0.0295	0.00625	-0.00851	-0.0125	-0.0125
	(0.0170)	(0.0925)	(0.0603)	(0.0428)	(0.0346)	(0.0166)	(0.0166)	(0.0183)	(0.0186)
Decision on child health	0.201***	1.090	0.359	0.220	0.283***	0.180**	0.181***	0.186**	0.190***
	(0.0635)	(0.919)	(0.267)	(0.213)	(0.0990)	(0.0759)	(0.0665)	(0.0723)	(0.0730)
Beating justified	-0.165***	0.383	-0.197	-0.260	-0.153	-0.161**	-0.158**	-0.156**	-0.156**
	(0.0611)	(0.758)	(0.393)	(0.227)	(0.0933)	(0.0798)	(0.0716)	(0.0773)	(0.0790)
Food secured	0.281	0.678	-1.482	0.526	0.154	0.328	0.540*	0.479*	0.479*
	(0.214)	(1.465)	(1.155)	(0.822)	(0.297)	(0.324)	(0.288)	(0.279)	(0.278)
Food secured and education	00.0258	-0.0242	0.151	0.0744	-0.0232	-0.0586	-0.0945	0.00250	0.00250
	(0.0616)	(0.125)	(0.102)	(0.0814)	(0.0737)	(0.0831)	(0.0969)	(0.0988)	(0.0993)
Food secured but beating justified	-0.225	-0.375	0.0574	-0.325	-0.218	-0.0954	-0.136	-0.205	-0.205
	(0.185)	(0.920)	(0.619)	(0.430)	(0.270)	(0.249)	(0.229)	(0.232)	(0.231)
Food secured but no mother decision	-0.273	0.841	1.572	-0.363	-0.253	-0.315	-0.474*	-0.446	-0.450
	(0.213)	(1.429)	(1.145)	(0.816)	(0.309)	(0.309)	(0.283)	(0.277)	(0.277)
Constant	-0.870***	-5.826***	-3.518***	-2.550***	-1.829***	-1.155***	-0.903***	-0.867***	-0.867***
	(0.0614)	(0.956)	(0.229)	(0.214)	(0.0951)	(0.0729)	(0.0682)	(0.0712)	(0.0719)

Standard errors in parentheses* p<0.01, ** p<0.05, * p<0.1**

Source: Essilfie (2020)

The results in Table 4 and Table 5 show that relative empowerment is significant in improving the health status of acutely malnourished children for height-for-age and moderately malnourished children for weight-for-age respectively at 10 percent (p value<0.1) level of significance. This underscores the fact that mother's relative education tends to impact greatly on those at the upper end of the distribution (over-nourished children), as shown in the stepwise regression, and acutely malnourished, as shown in the full model for height-for-age for the QR. The results, therefore, underscore the importance of mother's education in improving the health status of children. Hence, according to the results, women empowerment (proxied by relative years of schooling) is associated with better nourishment of children at both the lower and the upper conditional distribution of nutritional measures and also implies that children of mothers with little education tend to be undernourished.

Apart from the stepwise regression, average years of schooling is controlled for to capture the importance of some form of parental education. In all the estimation techniques (OLS, QR, and IV), average years of schooling was positive and significant in explaining the nutritional status of children. Thus, the results underscore the importance of parental education in improving the health of the child. For instance, in Table 4, except for acutely malnourished children, average years of schooling was significant and positive for severely malnourished children through to normal children of at least 5 percent (p value < 0.05) level of significance for child's height-for-age.

A similar instance is recorded for weight-for-age, as average years of schooling is significant and positive in improving the health of children who are moderately malnourished through to children with normal weight-for-age

Z-scores (Table 5). The IV results (Appendix C3) also underscore the importance of parental education in improving the health of children. In a nutshell, parental education, especially mother's education relative to the partner, is significant in improving the health of the child in the sense that an educated mother will be more knowledgeable about issues relating to child health and hence makes decisions that will help improve the health of the child. Also, because the woman is relatively better educated, her bargaining power increases, which makes her able to negotiate for the betterment of herself and that of the child in the household. The works of some authors (Abuya, Ciera, & Kimani-Murage, 2012; Chen & Li, 2009; Wamani, Tylleskär, \AAstrøm, Tumwine, & Peterson, 2004; Stamenkovic, Djikanovic, Laaser, & Bjegovic-Mikanovic, 2016; Miller & Rodgers, 2009; Maïga, 2013) confirm this current study that mother's education has a significant positive effect in improving the health status of children.

Autonomy in decision-making of the mother

Mother's autonomy in decision-making in the day-to-day activities as proxied by "she makes a decision regarding the health of the child" was statistically significant for height-for-age (stunting) and weight-for-age (underweight) for all the estimation techniques employed in the analysis. The QR results in Table 3 indicate that mother's decision-making helps improve the nutritional status of children who are moderately undernourished for height-for-age and underweight at 1 percent (p value <0.01) level of significance. When other explanatory variables were added, mother's decision-making was statistically significant in explaining the nutritional status of children for the OLS and QR.

The results of the QR suggest that the positive association between mothers' decision-making and height-for-age and weight-for-age is more clearly observed for children who are moderately malnourished to normal. Taking the case of weight-for-age in Table 5, the coefficient estimate is positive and significant, with the estimate larger (0.170) for moderately malnourished children. The results from the IV (see Appendix C3) also showed a positive relationship between mother's decision making and child's height-for-age and weight-for-age. The coefficients were 0.159 and 0.188 at 5 percent level of significance. This means that having autonomy is associated with improvement in the height-for-age and weight-for-age. This finding underscores the fact that mother's autonomy could play a vital role in reducing stunting and underweight in children under the age of five. This assertion supports the works of Shroff et al. (2009), Rahman, Saima, and Goni (2015), Carlson, Kordas, and Murray-Kolb (2015), and Abate and Belachew (2017) that children whose mothers participate in household decisions are more likely to have improved health status. Thus, raising maternal autonomy is an important goal for improving children's nutritional status.

Acceptance towards domestic violence

Acceptance towards domestic violence, measured as whether a husband is justified by beating the mother of the child if she neglects her responsibility towards the children, is negative and statistically significant for OLS and for most of the nutritional scores for the QR at 5 percent for both height-for-age and weight-for-age children, as shown in Table 3. The QR shows that acceptance towards domestic violence negatively affects children who are moderately malnourished to children of normal height-for-age and weight-for-

age. This means that lack of women's empowerment (domestic violence) is associated with child malnutrition. In a nut shell, it can be said that children with mothers who are less empowered are likely to have poor nutritional status, compared to their counterparts who are not. This is consistent with the works of Frances (2009), Yount, DiGirolamo, and Ramakrishnan (2011) as well as Sobkoviak, Yount, and Halim, (2012).

Table 4: Women empowerment and food security on prevalence of stunting among children under-five

	OLS	QUANTITLES						
Variables	**Height-for age**	**Acutely malnourished**	**Severely malnourished**	**Moderately malnourished**	**Normal**		**Over-weight**	
Relative years of schooling	0.00338	0.130**	0.0213	0.0235	0.0198	-0.00573	-0.0190	-0.0196	-0.0176
	(0.0183)	(0.0594)	(0.0552)	(0.0408)	(0.0208)	(0.0180)	(0.0208)	(0.0216)	(0.0218)
Average schooling years	0.0217**	0.0323	0.0584**	0.0434***	0.0265**	0.0228**	0.0153	0.0177*	0.0177*
	(0.00846)	(0.0472)	(0.0298)	(0.0154)	(0.0129)	(0.0106)	(0.00992)	(0.0102)	(0.0103)
Decision on child health	0.195***	0.299	0.0206	0.193	0.229**	0.275***	0.318***	0.324***	0.318***
	(0.0701)	(0.322)	(0.233)	(0.132)	(0.0937)	(0.0776)	(0.0803)	(0.0847)	(0.0844)
Acceptance towards domestic violence	-0.0167	0.449	0.309	0.0758	-0.0285	-0.0311	-0.0416	-0.0166	-0.0165
	(0.0700)	(0.293)	(0.232)	(0.119)	(0.102)	(0.0826)	(0.0826)	(0.0836)	(0.0839)
Food secured	0.362*	0.112	1.628	0.575	0.871***	0.408*	0.406*	0.355	0.349
	(0.207)	(1.303)	(1.308)	(0.702)	(0.294)	(0.233)	(0.244)	(0.251)	(0.251)
Food secured with education	-0.00368	0.154	0.0841	0.0102	-0.0884	0.0236	0.115	0.118	0.110
	(0.0608)	(0.222)	(0.228)	(0.229)	(0.0999)	(0.104)	(0.0936)	(0.0911)	(0.0909)
Food secured with acceptance towards domestic violence	-0.442**	-1.505	-1.930*	-0.468	-0.570**	-0.342	-0.321	-0.331	-0.339
	(0.201)	(1.063)	(1.042)	(0.632)	(0.279)	(0.245)	(0.249)	(0.252)	(0.253)
Food secured without decision	-0.242	-0.506	-1.663	-0.419	-0.505*	-0.379	-0.326	-0.326	-0.312
	(0.209)	(1.295)	(1.202)	(0.626)	(0.303)	(0.247)	(0.257)	(0.260)	(0.260)
Child age	-0.933***	-1.236***	-0.878***	-0.870***	-0.851***	-0.918***	-0.935***	-0.931***	-0.912***
	(0.0734)	(0.363)	(0.236)	(0.127)	(0.101)	(0.0897)	(0.0885)	(0.0903)	(0.0906)
Squared of age	0.179***	0.270***	0.177***	0.181***	0.174***	0.180***	0.179***	0.177***	0.172***
	(0.0170)	(0.0856)	(0.0609)	(0.0299)	(0.0231)	(0.0206)	(0.0211)	(0.0217)	(0.0218)

Table 4 Cont'D

Health insurance	0.211***	0.761*	0.103	0.133	0.134	0.220**	0.208***	0.248***	0.247***
	(0.0669)	(0.401)	(0.252)	(0.139)	(0.0906)	(0.0855)	(0.0761)	(0.0751)	(0.0753)
Flush toilet	0.00756	-0.397	-0.309	0.0524	-0.00238	0.00745	-0.00794	-0.00899	-0.00778
	(0.0244)	(0.716)	(0.319)	(0.0544)	(0.0397)	(0.0418)	(0.0618)	(0.0677)	(0.0686)
Mother's occupation									
Service	0.0872	0.866**	0.575*	0.117	0.134	0.101	0.124	0.116	0.104
	(0.0793)	(0.373)	(0.320)	(0.148)	(0.107)	(0.0922)	(0.0888)	(0.0894)	(0.0894)
Manual work	0.0648	1.186***	0.540*	0.0324	0.0290	0.0710	0.0714	0.0545	0.0678
	(0.0759)	(0.339)	(0.311)	(0.145)	(0.100)	(0.0928)	(0.0966)	(0.0981)	(0.0981)
Male child	-0.0738	0.269	-0.0944	-0.0250	-0.0782	-0.0655	-0.0997	-0.120*	-0.121*
	(0.0578)	(0.288)	(0.187)	(0.106)	(0.0873)	(0.0670)	(0.0656)	(0.0667)	(0.0670)
Presence of radio	0.188***	0.672**	0.639**	0.271*	0.171*	0.157*	0.178**	0.193**	0.178**
	(0.0659)	(0.331)	(0.287)	(0.151)	(0.0905)	(0.0808)	(0.0739)	(0.0768)	(0.0769)
Household size	-0.00856	0.0853*	0.0481	0.0138	-0.0143	0.000751	0.00491	0.00659	0.00328
	(0.0131)	(0.0477)	(0.0410)	(0.0226)	(0.0212)	(0.0175)	(0.0166)	(0.0157)	(0.0156)
Age of mother	0.0370	-0.111	-0.103	0.00819	0.0380	0.0411	0.0118	0.0200	0.0228
	(0.0409)	(0.183)	(0.133)	(0.0570)	(0.0603)	(0.0577)	(0.0544)	(0.0541)	(0.0541)
Squared of age	-0.000148	0.00187	0.00197	6.10e-06	-0.000229	-0.000265	0.000271	0.000159	0.000113
	(0.000611)	(0.00269)	(0.00196)	(0.000861)	(0.000930)	(0.000852)	(0.000806)	(0.000800)	(0.000800)
Time to water source	-0.00687***	0.00445	0.00209	-0.00656**	-0.00856***	-0.00837***	-0.00784***	-0.00775***	-0.00748***
	(0.00171)	(0.00796)	(0.00425)	(0.00304)	(0.00277)	(0.00225)	(0.00210)	(0.00214)	(0.00214)
Zones: Base is forest zone									
Coastal	-0.0181	-0.713	-0.580**	-0.232	-0.189*	-0.0106	0.00178	0.0449	0.0434
	(0.0753)	(0.439)	(0.292)	(0.147)	(0.102)	(0.0958)	(0.0949)	(0.0985)	(0.0993)

Table 4 Cont'D

Savannah	0.00159	-0.395	-0.460**	-0.220	-0.108	-0.0650	-0.0315	0.00984	-0.00116
	(0.0730)	(0.300)	(0.227)	(0.135)	(0.112)	(0.0885)	(0.0848)	(0.0873)	(0.0875)
Birth order									
Second birth	0.120	0.209	0.358	0.261*	0.147	0.193	0.145	0.0863	0.0972
	(0.0958)	(0.458)	(0.323)	(0.156)	(0.127)	(0.122)	(0.127)	(0.137)	(0.138)
Third birth	-0.0726	-0.758	-0.482	0.133	0.106	0.0332	0.0283	-0.0490	-0.0528
	(0.108)	(0.541)	(0.449)	(0.226)	(0.124)	(0.129)	(0.129)	(0.137)	(0.138)
Fourth birth	-0.287**	-0.0845	-0.285	-0.138	-0.133	-0.158	-0.215	-0.262	-0.266
	(0.121)	(0.473)	(0.394)	(0.204)	(0.159)	(0.148)	(0.154)	(0.163)	(0.164)
Constant	-1.489**	-4.098	-2.555	-2.648***	-2.258**	-1.934**	-1.331	-1.432*	-1.442*
	(0.619)	(2.931)	(2.021)	(0.838)	(0.919)	(0.893)	(0.839)	(0.831)	(0.831)
Observations	1,616	1,616	1,616	1,616	1,616	1,616	1,616	1,616	1,616

Standard errors in parentheses* p<0.01, ** p<0.05, * p<0.1**

Source: Essilfie (2020)

Table 5: Women empowerment and food security on prevalence of underweight among children under-five

	OLS	QUANTITLE						
Variables	**Weight-for-age**	**Acutely malnourished**	**Severely malnourished**	**Moderately malnourished**	**Normal**		**Over-weight**	
Relative years of schooling	0.0190	0.0313	0.0430	-0.0112	0.0477*	0.0220	0.00700	0.00398	0.00362
	(0.0170)	(0.0542)	(0.0500)	(0.0440)	(0.0286)	(0.0165)	(0.0203)	(0.0207)	(0.0208)
Average years of schooling	0.0242***	0.0193	0.0147	0.0366*	0.0345***	0.0166	0.0181*	0.0180	0.0182
	(0.00810)	(0.0374)	(0.0330)	(0.0195)	(0.0116)	(0.0115)	(0.0110)	(0.0112)	(0.0112)
Decision on child health	0.127**	0.186	0.381	0.202	0.170*	0.0936	0.0640	0.0905	0.0880
	(0.0625)	(0.295)	(0.282)	(0.165)	(0.0994)	(0.0825)	(0.0797)	(0.0810)	(0.0809)
Acceptance towards domestic violence	-0.0278	-0.358	-0.196	-0.0599	-0.0240	-0.0716	-0.0823	-0.0608	-0.0526
	(0.0614)	(0.297)	(0.286)	(0.168)	(0.0869)	(0.0781)	(0.0862)	(0.0876)	(0.0878)
Food secured	0.0935	-1.445	-1.440	0.207	0.0275	0.139	0.167	0.210	0.219
	(0.214)	(1.151)	(1.187)	(0.698)	(0.372)	(0.366)	(0.344)	(0.334)	(0.332)
Food secured with education	0.0283	-0.138	-0.181	0.0609	-0.0478	-0.0451	0.0152	0.0322	0.0306
	(0.0560)	(0.152)	(0.148)	(0.0931)	(0.0782)	(0.0891)	(0.0937)	(0.0946)	(0.0954)
Food secured with acceptance towards domestic violence	-0.163	0.583	0.448	-0.152	-0.293	-0.121	0.166	0.0298	0.0185
	(0.180)	(0.635)	(0.627)	(0.388)	(0.258)	(0.273)	(0.263)	(0.261)	(0.260)
Food secured with decision	-0.164	2.217*	2.127*	-0.250	0.0309	-0.211	-0.371	-0.323	-0.337
	(0.213)	(1.137)	(1.163)	(0.705)	(0.359)	(0.351)	(0.320)	(0.311)	(0.308)
Child age	-0.320***	0.913**	0.258	-0.364**	-0.248**	-0.223***	-0.245***	-0.280***	-0.270***
	(0.0644)	(0.389)	(0.375)	(0.165)	(0.0984)	(0.0818)	(0.0876)	(0.0889)	(0.0888)

Table 5 Cont'D

Child age	0.0609***	-0.184**	-0.0529	0.0924**	0.0550**	0.0411**	0.0411**	0.0466**	0.0437**
	(0.0149)	(0.0849)	(0.0813)	(0.0377)	(0.0224)	(0.0192)	(0.0193)	(0.0197)	(0.0198)
Health insurance	0.208***	0.483*	0.430*	0.384**	0.198**	0.177**	0.183**	0.193**	0.193**
	(0.0599)	(0.281)	(0.247)	(0.161)	(0.0883)	(0.0748)	(0.0755)	(0.0755)	(0.0754)
Flush toilet	0.0513	-0.482	-0.270	0.0622	0.0157	0.0427	0.0327	0.0284	0.0289
	(0.0352)	(0.456)	(0.384)	(0.0972)	(0.0572)	(0.0616)	(0.0635)	(0.0632)	(0.0630)
Mother's Occupation									
Service	-0.0375	0.156	0.182	-0.0282	-0.00155	-0.0135	-0.0524	-0.0279	-0.0301
	(0.0684)	(0.273)	(0.239)	(0.174)	(0.0936)	(0.0912)	(0.0942)	(0.0950)	(0.0948)
Manual	-0.0845	-0.155	-0.129	0.0635	0.0322	-0.0696	-0.126	-0.157*	-0.156*
	(0.0660)	(0.338)	(0.285)	(0.158)	(0.101)	(0.0822)	(0.0826)	(0.0827)	(0.0826)
Male child	0.0175	-0.123	-0.182	-0.0645	0.00914	0.0543	0.0133	-0.00213	-0.00582
	(0.0510)	(0.233)	(0.218)	(0.152)	(0.0787)	(0.0673)	(0.0668)	(0.0676)	(0.0679)
Radio	0.0728	0.290	0.281	0.127	0.0594	0.0773	0.0620	0.0359	0.0304
	(0.0586)	(0.247)	(0.230)	(0.143)	(0.0819)	(0.0702)	(0.0858)	(0.0866)	(0.0863)
Household size	-0.00362	-0.110*	-0.110*	-0.0172	0.00759	-0.0112	-0.00307	-0.00745	-0.00564
	(0.0124)	(0.0613)	(0.0565)	(0.0407)	(0.0183)	(0.0159)	(0.0164)	(0.0165)	(0.0166)
Woman age	0.0119	-0.329***	-0.240**	-0.0145	-0.0143	0.0394	0.0493	0.0507	0.0474
	(0.0380)	(0.122)	(0.110)	(0.0857)	(0.0586)	(0.0455)	(0.0521)	(0.0530)	(0.0532)
Squared of age	-5.00e-06	0.00516***	0.00384**	0.000464	0.000346	-0.000450	-0.000612	-0.000621	-0.000578
	(0.000559)	(0.00183)	(0.00167)	(0.00126)	(0.000842)	(0.000684)	(0.000784)	(0.000798)	(0.000800)
Time of water source	-0.00464***	-0.000585	-0.000757	-0.00498	-0.00484**	-0.00666***	-0.00639***	-0.00555***	-0.00559***
	(0.00153)	(0.00673)	(0.00609)	(0.00436)	(0.00241)	(0.00200)	(0.00203)	(0.00198)	(0.00198)
Zones									
Coastal	-0.0311	-0.600*	-0.545*	-0.224	-0.119	-0.0268	0.0224	0.0527	0.0628
	(0.0681)	(0.322)	(0.296)	(0.196)	(0.0992)	(0.0921)	(0.0825)	(0.0832)	(0.0833)
Savannah	-0.146**	-0.256	-0.119	-0.129	-0.258***	-0.157*	-0.187**	-0.189**	-0.185**
	(0.0659)	(0.309)	(0.273)	(0.155)	(0.0946)	(0.0894)	(0.0917)	(0.0937)	(0.0940)

Table 5 Cont'D

Birth order									
Second birth	0.0779	0.528	0.649*	0.368*	0.154	0.0698	0.0425	0.0494	0.0564
	(0.0894)	(0.356)	(0.332)	(0.204)	(0.145)	(0.119)	(0.117)	(0.118)	(0.119)
Third birth	0.0838	0.311	0.341	0.283	0.173	0.0975	0.0288	0.00987	0.0204
	(0.105)	(0.432)	(0.401)	(0.266)	(0.169)	(0.123)	(0.130)	(0.134)	(0.135)
Fourth birth	-0.0283	0.515	0.475	0.0890	0.133	0.0126	-0.0188	-0.0426	-0.0342
	(0.119)	(0.411)	(0.386)	(0.301)	(0.202)	(0.145)	(0.150)	(0.153)	(0.154)
Constant	-1.130**	0.627	-0.302	-2.820**	-1.877**	-1.762**	-1.553**	-1.483*	-1.436*
	(0.574)	(2.066)	(1.850)	(1.199)	(0.870)	(0.724)	(0.750)	(0.764)	(0.767)
Observations	1,616	1,616	1,616	1,616	1,616	1,616	1,616	1,616	1,616

Standard errors in parentheses* p<0.01, ** p<0.05, * p<0.1**

Source: Essilfie (2020)

Other covariates

This section discusses other explanatory variables used in estimating the OLS, IV, and QR. It must be noted that there exist some variations in terms of the coefficients estimated using OLS, QR, and IV. For instance, in some cases, the results of the QR are different from the OLS, with different signs at the different point of conditional distribution. For instance, the age of the child is negative and significant with its squared positive and significant for all the estimation techniques for height-for-age and weight-for-age, implying that, as the child ages, there is the possibility that the values for height-for-age and weight-for-age improve.

Food security

In order to examine the effect of food security on the nutritional status of children, consumption of food items consumed by the child from each of the six food groups (Grain group, Vitamin A group, Vegetable and fruit group, Meat group, Eggs and legumes group, Diary group) is used to calculate the dietary diversity of the child. Children who consumed at least three items from the food groups are categorised as food secured while those who consumed less than three are grouped as food insecure to see how food security will affect the health of the child. Also, an interaction of women empowerment is done to find out how food security and women's empowerment jointly explain child's nutritional status.

Even though food security was not statistically significant in explaining weight-for-age for IV results and OLS, QR results for height-for-age indicate that food security is significant in improving the health of the child (from moderately malnourished to normal), with greater impact on

children who are moderately malnourished (0.871) at the 1 percent level of significance, as shown in Table 4 above. This means that children who are food insecure are more likely to have poor nutritional status than their counterparts who are food secured. This also implies that, aside other household variables that may have a significant effect in improving the health of the child, one cannot deny the importance of adequate nutrition of the child, especially at the early stage of development. For instance, Matheson, Varady, Varady, and Killen (2002) highlighted that food insecurity is negatively associated with child health. Quite a number of authors also have highlighted the importance of food security in improving the health of the child (Black, 2014; Council on Community Pediatrics on Nutrition & Committee, 2015; Ke & Ford-Jones, 2015; Larson & Story, 2011; Nackers & Appelhans, 2013)

Another striking observation from the study is that households with children who are food secure but with mothers who have positive attitude towards domestic violence tend to have poor health status, as shown in Table 4. However, it is recorded in Table 5 above that a child who is food secure and has a mother who is given the opportunity to make decisions in the household regarding the health of the child tends to have improvement in weight-for-age, especially for acutely and severely malnourished children at 10 percent (p value <0.1) level of significance. This implies that women empowerment, proxied by women decision-making and food security, jointly improves the health status of children under-five.

Household access to healthcare scheme

Household access to health insurance is proxied by "whether any member of the household has access to health insurance or healthcare scheme,

either private or government." The results suggest that household access to health insurance or health care scheme is associated with better nutritional status for all the estimation techniques employed as shown in Table 4, Table 5 and Appendix C3. The estimated coefficient of health insurance on height-for-age and weight-for-age is not only significant but also quite large for all the estimation techniques. The results imply that policy intervention aimed at improving healthcare access to all, especially mothers, will help improve the nutritional status of children in terms of height-for-age and weight-for-age. This is because having access to health scheme enables the household to access quality health for the child (Murphey, 2017; Nguyen & Wang, 2013; Palmer, Mitra, Mont, & Groce, 2015).

Environmental factors

The results in Table 4 and Table 5 show that time necessary for getting water is negative and statistically significant in almost all cases for height-for-age and weight-for-age for QR and OLS. The IV results also showed a negative association between time necessary for getting water on child height-for-age. This is expected in the sense that water is an essential commodity that every household need for its daily activities such as drinking, washing, and for other hygienic purposes. However, fetching of water is seen as one of the responsibilities of mothers and hence there exists a trade-off between this activity and taking care of the child, as seen in the works of Pickering and Davies (2012). The ecological zones of the children had a significant negative effect on the health of the child (Friedrich, 2012; Pickering & Davis, 2012). The QR results in Tables 4 and Table 5 show that children found in the coastal and savannah zones tend to have poor nutritional status than their counterparts

within the forest belt. This may be due to the high levels of poverty and lack of improved social amenities needed for promoting health of both young and old.

Characteristics of the child

In Table 4,

QR results showed that having a second child does not negatively affect child health for weight-for age Z scores. Even though, Rahman (2016), examined the net effect of birth order on child nutritional status in Bangladesh using logistic regression and found that higher order (fourth and fifth birth) was associated with higher rate of stunting among children (Rahman, 2016). According to Kahn (2014), birth order effects are seen to be very strong in the case of stunting, which represents the long-term nutritional status of children and less obvious in the case of wasting for children under the age of five this assertion is not supported by this current study (Tiwari, Ausman, & Agho, 2014) .

Household characteristics

As the number of members in the household increases, the care given to each child reduces, as resources must be shared among them equally, and this impacts negatively on their health (Imai et al., 2014). From the empirical results, it can be seen that, as the number of members in the household increases, it negatively impacts on weight-for-age (acutely and severely malnourished children) at 5 percent level of significance, as seen in Table 5 above. That is to say that having larger household size is associated with lower levels of nutrition, especially weight-for-age, in the sense that there will be pressure on household resources as these resources are shared among

members. Age of the mother, on the other hand, is negative and significant, with its squared positive and significant at the lower tail of the distribution for weight-for-age, which implies that older mothers tend to have better nourished children with a non-linear effect for weight-for-age.

The results in Tables 4 and Table 17 (see Appendix C3) show that households having a radio is associated with better nutritional status for height-for-age in most of the cases at 5 percent level of significance. However, it can be seen that its effect is slightly higher in children with Z-score < - 4 for height-for-age (acutely stunted) and for those with Z-score < -3 (severely malnourished). This implies that presence of radio in the household may be a medium through which a household can access information on nutrition and on other household practices that can go a long way to improve the health of the child.

Occupation of the mother

Maternal occupation is known in the literature to have either positive or negative effect on child health in relation to the type of work done by the mother. This study categorised maternal occupation into three groups (service, manual work, and not employed at all) to analyse how it relates to child health. The findings from the study showed that mothers who are employed either in the service sector or engaged in manual work tend to have children with better health status than their counterparts who are not working at all. In Table 4, the QR results show a positive association between maternal occupation and child health for those who are severely and acutely malnourished. This assertion supports the findings made by other authors that maternal employment helps in improving child health because the mother becomes economically

empowered and hence able to provide better care for the child (Lü, Zhai, Jin, & Ge, 1999).

Table 4 also shows that children with mothers engaged in manual work have a better nutritional status (height-for-age) than their counterparts who are not employed at all. This assertion supports the findings of Adeladza (2009), who asserted that children whose parents engaged in manual work (mechanical or factory) tend to have better weight-for-age Z-score, compared to their counterparts who are not. This could be due to the fact that parents in this category probably get higher income and also enough time to cater for their children (Adeladza, 2009).

Chapter Summary

This chapter presented results and discussions on the effect of women empowerment on child nutritional status. Using OLS, QR, and IV, this paper explored the effects of women empowerment variables (such as a mother's years of schooling relative to her partner, acceptance towards domestic violence, and mother's decision-making) and other variables such as household access to health insurance, household size, sex of child, and birth order on children's nutritional status (height-for-age and weight-for-age) at different points in its conditional distribution, using 2014 Ghana Demographic and Health Survey dataset. The study revealed that OLS estimates of the determinants of child weight-for-age and height-for-age, which effectively estimate the effects of intervention variables at the mean, can be misleading.

First of all, the OLS estimation shows that women empowerment, measured by relative education, has no significant effect on child health (height-for-age and weight-for-age). However, the QR showed that the

positive effect of parental education can be felt at the upper end of the conditional distribution rather than the tail end of the distribution. Also, other household characteristics such as household access to radio, health insurance, and food security were statistically significant in improving height-for-age and weight-for-age for OLS, and QR estimation techniques.

In a nutshell, the results underscore the importance of mother's education, mother's decision-making, and absence of domestic violence as critical factors needed to improved nutritional status of children. Also, health insurance, reduced number of household members, and presence of radio are all important indicators improving the nutritional status of children under age five. The next empirical chapter investigates women empowerment and household food security in Ghana.

CHAPTER SIX

EFFECT OF WOMEN EMPOWERMENT ON FOOD SECURITY IN GHANA

Introduction

This chapter investigates women empowerment and household food security in Ghana. It focuses on how the three measures of women empowerment (mother's years of schooling relative to the partner, mother's decision-making, and acceptance towards domestic violence) affect household food security. The chapter tests two hypotheses: (a) The probability of a household becoming food secure increases as women empowerment increases, and (b) Varying perspectives of women empowerment have a significant effect on food security in the household. In measuring food security, the study uses the experience-based approach to categorise the state of food security in the household into three levels: mild or no hunger (food secure), moderate hunger, and severe hunger. This measure of food security is used because experience-based scales act as direct measures of food security, rather than relying on proxy measures like the other indicators. Of the four dimensions of food security, experience-based food security scales are the only measure that evaluates the access component directly (Food and Agricultural Organization, 2014).

In order to evaluate the effect of women empowerment on the various levels of food security, Generalized Ordered Logit Model (GOLM) was used over ordered logit because it is more parsimonious, provides a better fit for data, and satisfies the proportional odds assumptions, which is mostly violated when ordered logit models are used (Williams, 2016). Given the dynamisms

at the household level, margins were used to capture the varying dimensions of women empowerment and how it may affect household food security. Also, dominance analysis was done to determine the most dominant women empowerment variable necessary for improving household food security. Variables used, their a priori expectations, and definitions are presented in the Appendix (see Appendix B2). The study uses the GLSS7 dataset since it contains the questions needed in measuring the food insecurity scale (see Appendix A). The next section presents discussions of the results from the various estimation techniques. Since the coefficients of the GOLM do not represent the magnitude of the effects of the explanatory variables, the odds ratios are discussed.

Women empowerment and household food security in Ghana

Table 6 below shows the results from GOLM on the effect of women empowerment on household food security in Ghana. Here, the policy or key variable of interest is the women empowerment which is measured from three perspectives: mother's decision making, relative years of schooling, and acceptance towards domestic violence. The results in Table 6 indicate that, as relative years of schooling increases by 1, the household is 15 percent more likely to experience mild or no hunger than to experience severe food insecurity at 10 percent level of significance (p value<0.1). That is, a household with a woman who is relatively better educated is 15 percent more likely to have better food security status. This is because an educated woman can educate her household members on agriculture, nutrition, and hygiene, and provide basic literacy training, all of which can lead to higher standards of living and greater food security. This finding is consistent with extant

literature (Abu & Soom, 2016; Hassen, Zinab, & Belachew, 2016; Olumakaiye & Ajayi, 2006).

Autonomy proxied by women's decision-making was statistically significant in explaining food security. A household where the woman is given the opportunity to make decisions, as compared to other households that do not, is 67 percent more likely to be in the moderate category of food insecurity than to be in the severe category, indicating an improvement in the food security status at 10 percent level of significance (p value<0.1). This is because the primary roles played by the woman in the household includes ensuring that food is available upon request, and they are in the best position to make good decisions that will benefit the households. The implication is that women's decision-making in the household decreases household food insecurity, and this finding is consistent with extant literature (Amugsi et al., 2016; Langat, 2016). The findings also support Sen's Capability theory in the sense that, an empowered woman is able to make choices that best improve her life and that of her household.

For instance, Nyamwanji (2016) revealed that households in which women did not participate in decisions about income and food management were more vulnerable to household food insecurity because men were not concerned with household food requirements. According to her, women's noninvolvement in decision-making in insuring food management impacts negatively on household food security. Hence, she recommended the need to address gender inequalities with regard to ownership and control over resources and ensure women decision-making at the household level in order to improve household food security (Nyamwanji, 2016). Acceptance towards

domestic violence, on the other hand, was not statistically significant in explaining household food security. Domestic violence on the other hand was not statistically significant in explaining household food security in Ghana.

Table 6: Women empowerment and household food security in Ghana

Food insecurity	Odds Ratio	Std. Err.	Z	P>z	[95% Conf.	Interval]
Mild/no hunger						
Relative years of schooling	1.152505	.0860763	1.90	0.057	.9955656	1.334185
domestic violence	.5056965	.4791059	-0.72	0.472	.0789672	3.238422
Engaged in farming	1.728314	.3557873	2.66	0.008	1.154506	2.587315
Household exp on non-food items	.9992579	.0001594	-4.65	0.000	.9989455	.9995705
Autonomy	1.606589	.5501192	1.38	0.166	.8211855	3.143175
Household size	1.09902	.0467985	2.22	0.027	1.01102	1.194679
Age	.99439	.0071424	-0.78	0.433	.9804892	1.008488
Expenditure on water	1.000223	.0000959	2.32	0.020	1.000035	1.000411
No PWD	1.091209	.7877186	0.12	0.904	.2651218	4.491285
Zones						
Coastal	.9376392	.173863	-0.35	0.728	.6519294	1.348562
Savannah	.6156253	.1303392	-2.29	0.022	.4065382	.932248
Cons	1.852703	1.580723	0.72	0.470	.3479863	9.863921
Moderate food insecurity						
Relative years of schooling	.9242476	.0411283	-1.77	0.077	.8470529	1.008477
domestic violence	.5631372	.6383569	-0.51	0.612	.0610542	5.194132
Household engaged in farming	1.705248	.2684539	3.39	0.001	1.25252	2.321617
Expenditure on non-food	.9993394	.0001608	-4.11	0.000	.9990243	.9996546
Autonomy	1.669365	.5115557	1.67	0.094	.9156122	3.043626
Household size	1.014427	.0349984	0.42	0.678	.9480994	1.085395
Age	.9862963	.00603	-2.26	0.024	.9745481	.998186

Table 6 Cont'D

Expenditure on water	1.000083	.0000542	1.54	0.124	.9999772	1.00019
No PWD	6.394695	6.74801	1.76	0.079	.8083293	50.58845
Coastal	.5984839	.0954362	-3.22	0.001	.4378417	.8180651
Savannah	.8959723	.1666658	-0.59	0.555	.6222385	1.290126
Cons	.112033	.1267251	-1.94	0.053	.0122044	1.02843
Link test	_hat	_hatsq				
Mild	0.021	0.840				
Moderate	0.029	0.493				
Number of observations	1, 017					
Pseudo R2	0.0475					
Prob > chi2	0.0000					

Source: Essilfie (2020)

Other covariates

Compared with households that do not engage in any form of farming activities, a household that engages in farming activities is 71 percent more likely to move from a severe state of food insecurity to moderate state of food insecurity at 5 percent level of significance (p value<0.05) and 73 percent more likely to experience mild to no hunger than to experience severe hunger at 5 percent level of significance (p value <0.05), as shown in Table 6 above. The implication of this finding is that farming positively influences the food security status of the household. This is because agriculture serves as the main source of food supply; therefore, produce from the farm can serve as a source of food, thereby reducing the rate of hunger in the household. This is consistent with the works of Baiphethi and Jacobs (2009), Ghattas, Barbour, Nord, Zurayk, and Sahyoun (2013), as well as Galhena, Freed, and Maredia (2013). Household size has a positive effect on food security. For example, an additional member of the household increases the chances of the household to experience mild or no hunger by approximately 10 percent at 5 percent level of significance (p value<0.05). Increase in household membership may lead to

a pool of resources to enhance the state of food security in the household, especially in the situation where majority of the family members are not dependants.

The results also show that, when the age of the household head increases by one, the household is 99 percent less likely to be in the moderate than being in a severe state of food insecurity at 5 percent level of significance (p value<0.05). This means that households with more aged household heads stand a higher chance of being food insecure. This is consistent with the work of Fernandes et al. (2018), who asserted that older adults are more likely to be food insecure. Not only that, but also findings from the works of Quandt and Rao (1999), Quine and Morrell (2006), and Ziliak, Gundersen, and Haist (2009) conclude that older people were more likely to be food insecure and be at risk of experiencing poor health status. Also, the results show that a household that has a number of disabled people stands a higher chance of being food insecure. This may be due to the fact that these persons become economically inactive and hence are unable to work to support the family.

There exist differences in the prevalence of hunger among the three ecological zones in the country. From Table 6, compared with those in the forest zone, residents in the coastal zone are 60 percent less likely to experience moderate food insecurity than to experience severe food insecurity at 5 percent level of significance (p value <0.05). This means that the prevalence of hunger is higher in the coastal zone than in the forest zone. A similar instance is seen in the savannah zone. This is because, compared with residents in the forest zone, residents in the savannah zone are 62 percent less likely to move from a severe state of food insecurity to mild or no hunger.

These findings support works done in Ghana on gross disparities among the various regions in the country. Savannah zone, especially, has been noted to be one of the most deprived zones in the county, with high rate of poverty and food insecurity. It is noted to be poorly endowed with resources, with per capita income of its population below average (Chagomoka et al., 2016; Marchetta, 2011; Nkegbe, Abu, & Issahaku, 2017; Quaye, 2008).

As the household expenditure on non-food items increases (such as utility bills), it has a negative effect on the state of security in that particular household. This is because resources that could have been used in buying food or meeting the nutritional needs of the household are channeled towards settling other household debts. From the results as shown in Table 6, if there is an additional increase in household non-food expenditure, that household is 100 percent less likely not to experience any form of food insecurity. Thus, the higher the expenditure on non-food items, the higher the level of food insecurity in that particular household.

Varying perspectives of women empowerment on food security

There exist varying levels of women empowerment in households, and these have a significant effect on the state of food security in these households. For example, there may be instances where a woman may have the opportunity to make decisions yet may not be educationally empowered, and there may also be a situation whereby a woman may be educationally empowered yet may not be given the opportunity to participate in any household decision. This section, therefore, analyses various scenarios and how these scenarios influence the state of food security in households.

Table 7 presents results on the effect of women's autonomy (decision-making) on household food security. The first column captures the state of food security and autonomy while the other columns capture the margins, standard errors, and the p values. From the table, in a mild or no hunger category household, if the woman has no autonomy, there is a 24 percent chance that the household will be food insecure. However, in a situation where a woman has autonomy, the chances of experiencing mild food insecurity fall to 21.2 percent. This variation is highly significant at 1 percent level of significance, indicating the relevance of autonomy in predicting the food security status of households. In a moderately food insecure household, if the woman is autonomous, the probability of the household becoming food insecure is 44 percent, as compared to when the woman has no autonomy (51 percent). Similarly, for a severely food insecure household, if the woman is allowed to participate in decision-making, the probability of that household becoming food insecure falls from 25 percent to 3 percent at 1 percent level of significance (p value <0.01). The results in Table 7 underscore the role of women in decision-making in improving household food security, which is consistent with extant literature (De Schutter, 2013; Galiè et al., 2019; Ibnouf, 2009; Meludu, Ifie, Akinbile, & Adekoya, 1999; Nazli & Hamid, 1999; Quisumbing, Brown, Feldstein, Haddad, & Peña, 1996; Shamsu-Deen, 2014).

Table 7: Women Autonomy and Household Food Security

	Margin	Std. Err.	P>z
Food security and decision making			
mild and no decision	.2424868	.0535254	0.000
Mild with decision	.2121862	.0130324	0.000
Moderate with no decision	.506681	.0601147	0.000
Moderate with decision	.4431367	.0159614	0.000
Severe with no decision	.2508322	.0490456	0.000
Severe with decision	.03446771	.0151393	0.000

Source: Author's construct, 2019

Table 8 presents results on the effect of varying levels of women empowerment and the probability of a particular household belonging to a particular state of food security status (mild, moderate or severe). Generally, the results from Table 8 show that, as women empowerment improves, the probability of the household being in a worse state of food insecurity reduces. For instance, the probability of a household to experience mild food insecurity, given that the woman does not have any form of empowerment (not educated, and does not take part in decision making), is 27 percent at 1 percent level of significance. However, in the same category of mild food insecurity, if the woman is given the opportunity to take decisions, the probability of the household experiencing mild food insecurity is reduced from 27 percent to 24 percent, indicating an improvement in the state of food security. Interestingly, in the mild category, a household where the woman is educationally empowered but does not participate in decision-making worsens

the state of food insecurity. Thus, absence of women's autonomy leads to a higher probability of household becoming food insecured (from 23 percent to 24 percent). However, in instances where the woman is educationally empowered and at the same time, given the opportunity to make decisions, the probability of the household experiencing mild food insecurity reduces from 24 percent to 19 percent at 1 percent level of significance (p value <0.01).

The results from Table 8 also show similar trends for moderately food insecure and severe food insecure categories. For instance, with the moderately food insecure category, the probability of a household belonging to such a group, given that there is no form of women empowerment, is 46 percent at 1 percent level of significance (p value<0.01). However, given the same category, if the woman makes decision even when she is not educationally empowered, the probability of such a household to belong to moderate food insecure category falls from 46 percent to 40 percent. In the severe category, without any form of women empowerment, the probability of a household being in such a category is 36 percent. However, higher levels of educational empowerment coupled with decision-making of the woman reduce the probability from 36 percent to 3 percent. This result underscores the importance of both women's education and decision-making in improving household food security (Langat, 2016; Malapit & Quisumbing, 2014; Sraboni, Quisumbing, & Ahmed, 2013; Sraboni, Malapit, Quisumbing, & Ahmed, 2014).

Table 8: Varying the level of Women Empowerment on Food security

	Margin	Delta-method Std. Err.	P>z
Food security and varying levels of empowerment			
Mild food insecure and no empowerment	.2683844	.0589948	0.000
Mild food, no education but autonomy	.2358165	.0186163	0.000
Mild with relative education emp but no auto	.2440465	.0539824	0.000
Mild with autonomy and edu. Emp	.2134962	.0131419	0.000
Mild with high level edu emp and auto	.1927032	.0167055	0.000
Moderate food insec. and no empowerment	.464076	.0653287	0.000
Moderate food insec., no edu but autonomy	.3996264	.0217603	0.000
Moderate food insec, edu but no autonomy	.4392726	0.0160437	0.000
Severe food insec. and no empowerment	.3645571	.0187878	0.000
Severe food insec., no edu but with auto	.2675396	.052072	0.000
Severe food insec. with edu but no autonomy	.3645571	0.0187818	0.000
Severe food insec. with auto and emp	.2528672	.0493759	0.000
Severe food insec, high levels of emp & auto	.03137366	.0225346	0.000

Source: Essilfie (2020)

The analysis above indicates that different perspectives on empowerment of women have different effects on the state of household food security. The question then becomes which of these dimensions of women empowerment has a greater impact on household food security. In order to

answer such a question, dominance analysis was done to identify the type of empowerment superior to the other measures of empowerment.

Table 9 presents the relative effect of all the explanatory variables on food security. From the table, autonomy significantly contributes most to household food security, followed by acceptance towards domestic violence, before woman's relative years of schooling (education). The implication of this finding is that, if the focus of the household is to increase food security, then woman empowerment in terms of women's decision-making should be prioritised. Another relatively significant promoter of household food security is negative attitude towards domestic violence.

Table 9: Dominance analysis

Food security	Dominance Stat.	Standardised Domin. Stat.	Ranking
Relative years of schooling	0.000	0.0005	10
Household engaged in farming	0.0077	0.2716	2
Acceptance towards domestic violence	0.0003	0.0122	9
Expenditure on non-food items	0.0130	0.4619	1
Autonomy	0.0010	0.0360	7
Household size	0.0011	0.0387	6
Age	0.0014	0.0480	4
Expenditure on water	0.0017	0.0592	3
No PWD	0.0009	0.0321	8
Zones	0.0011	0.0398	5
Number of observations			1,017
Number of regressions			1023
Overall fitstat			0.0282

Source: Author's construct, 2019

In Table 10, the study explores the combined importance of autonomy and education on food security since domestic violence is statistically significant in explaining food security. Evidently, autonomy and education jointly contribute greatest to household food security, followed by autonomy and finally education independently. The implication is that, even though a woman's autonomy, to a larger extent, contributes to food security of the household than education, the combined effect of the two is key to household food security.

Table 10: Dominance analysis of education and autonomy

Food security	Dominance Stat.	Standardized Domin. Stat.	Ranking
Acceptance towards domestic violence	0.0003	0.0124	10
Engaged in farming	0.0078	0.2745	2
Expenditure on non-food items	0.0130	0.4611	1
Autonomy	0.0004	0.0132	9
Relative years of schooling	0.0000	0.0002	11
Age	0.0015	0.0519	4
Expenditure on water	0.0017	0.0587	3
No PWD	0.0009	0.0322	7
Zones	0.0011	0.0398	6
Autonomy and relative education	0.0004	0.0134	8
Household size	0.0012	0.0426	5
Number of observations			1017
Number of regressions			2047
Overall fitstat			0.0282

Source: Author's construct, 2019

Chapter Summary

This chapter presented findings and discussions on women empowerment and household food security in Ghana. Using the experience-based approach measure of food security, the study employed the GOLM to estimate the effect of women empowerment on household food security. In addition, margins were calculated to capture varying levels of women empowerment and the probability of a household to belong to a particular category of food security status. For policy recommendation purposes, dominance analysis was estimated to capture the most dominant women's empowerment variable needed for the improvement in household food security.

Results from the GOLM estimates showed that women empowerment variables such as education and decision-making has a significant positive effect in improving household food security. However, other household variables such as household involvement in agricultural productivity, household size, and expenditure also have a significant effect on the state of household food security, while there also exist zonal disparities in household food security. The results from the dominance analysis indicated that, even though autonomy and education are all relevant in explaining the state of food security in the households, the combined effect of education and decision of the woman at the household level has a higher tendency of improving household food security.

Having determined the effect of women empowerment on food security in the country and having established the disparities in the state of food security among the zones, especially among people in the savannah zone,

then there is the need to delve into detail and examine how women empowerment can help mitigate this negative effect. Consequently, the next chapter presents a panel estimate of the effect of women empowerment and food security in northern Ghana. The chapter further analyses the sources of variations in hunger between male-headed and female-headed households.

CHAPTER SEVEN

WOMEN EMPOWERMENT AND FOOD SECURITY IN NORTHERN GHANA

Introduction

Studies over the years in Ghana on food security have highlighted high prevalence of hunger in the northern part of the country. Women participation in decision-making in this part of the country is low, compared to the south, due to cultural practices that favour men at the expense of women. Northern Ghana, especially Northern, Upper West, and Upper East Regions, is poorly endowed with natural resources and the income per capita of its population falls well below the national average. These regions have been described as poverty-stricken and hunger spots in Ghana (Agbadi, Urke, & Mittelmark, 2017; Marchetta, 2011; Nkegbe et al., 2017).

The incidence of poverty and malnutrition in children is also higher in the Northern part of the country. For instance, according to United Nations (2017), at Garizegu in the Sagnerigu District of the Northern Region, both men and women confirmed that there was hunger because households had to ration household food supplies and also had to buy cooked food almost on a daily basis, unlike in the past when there was abundant food supply for households. There exist differences in food security status at the national level and what actually pertains at the northern part of the country. Ironically, food is produced in these areas; however, people tend to be more food insecure (Cooke, Hague, & McKay, 2016; Parikh, 1991).

The seemingly contradictory indication between national statistics and what farmers in the rural and peri-urban areas are saying confirms the fact that

there is a widening inequality (and hunger) gap between the northern and southern part of the country. They are even net purchasers of food because they sell at low prices during harvests to meet critical cash requirements such as repayment of loans only to buy food later in the year at higher prices or go hungry. Indeed, hunger is primarily a problem of poverty and not of food production. Upper East is considered to have the worst form of food insecurity status, followed by Upper West and Northern Region. Since effort towards alleviation of hunger is dependent on availability of empirical evidence, it is very necessary to investigate the factors necessary for improving such a situation (Parikh, 1991).

This chapter, therefore, presents results and discussions on women empowerment and household food security and also determines the source of differences in hunger between male-headed and female-headed households in northern Ghana. In order to achieve this objective, a panel data on northern Ghana (Upper East, Upper West, Northern Region and some selected districts in the Brong-Ahafo Region) was used for the analysis.

The next section presents descriptive statistics, followed by results and discussions. In order to test the consistency of the results, both Random effect model and generalized estimating equation are estimated. In addition, multivariate decomposition for non-linear models is estimated to determine the factors contributing to differences in the prevalence of hunger and how women empowerment can help mitigate such a situation. In terms of regional distribution, the Upper East Region has the worse insecurity status (28%), followed by Upper West Region (16%) and the Northern Region (10%). It is, therefore, imperative to investigate the key factors influencing food security in

this part of the country. Efforts towards alleviating food insecurity largely depend on adequate evidence that provides the pathway for appropriate policy. This is the mandate of this empirical chapter: to investigate the determinants of food security in northern Ghana.

Descriptive Statistics

Food security status by gender and region is shown in Figures 11 and 12 respectively. In Figure 11, in all the hunger categories, males were more affected than females, irrespective of their status in the household. On the other hand, Northern Region has the highest incidence of all the categories of hunger scale. Brong Ahafo and Northern Regions maintain the order of the entire region where little to no hunger category is more than the moderate category, which is also more than the severe category. However, Upper West and Upper East Regions violate the order where the moderate categories outweigh the little to no hunger categories.

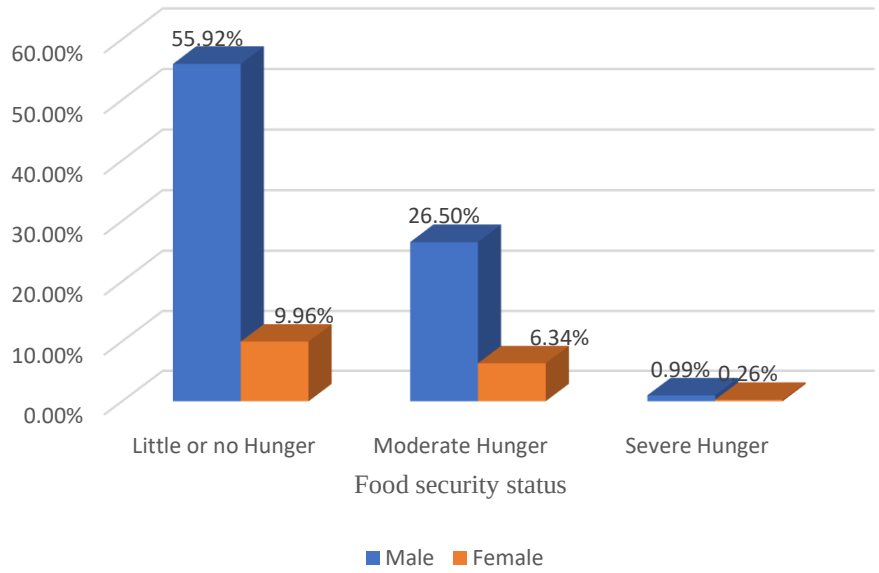

Figure 11: Food security status by gender of respondents

Source: Author's construct (2020)

As shown in Figure 11 above, 56 percent of men, whether household heads or not, suffered no hunger, while 27 and less than a percentage suffered moderate to severe hunger. 10 percent of the respondents who were females, irrespective of whether they were household heads or not, suffered no hunger while less than a percentage also suffered moderate to severe hunger.

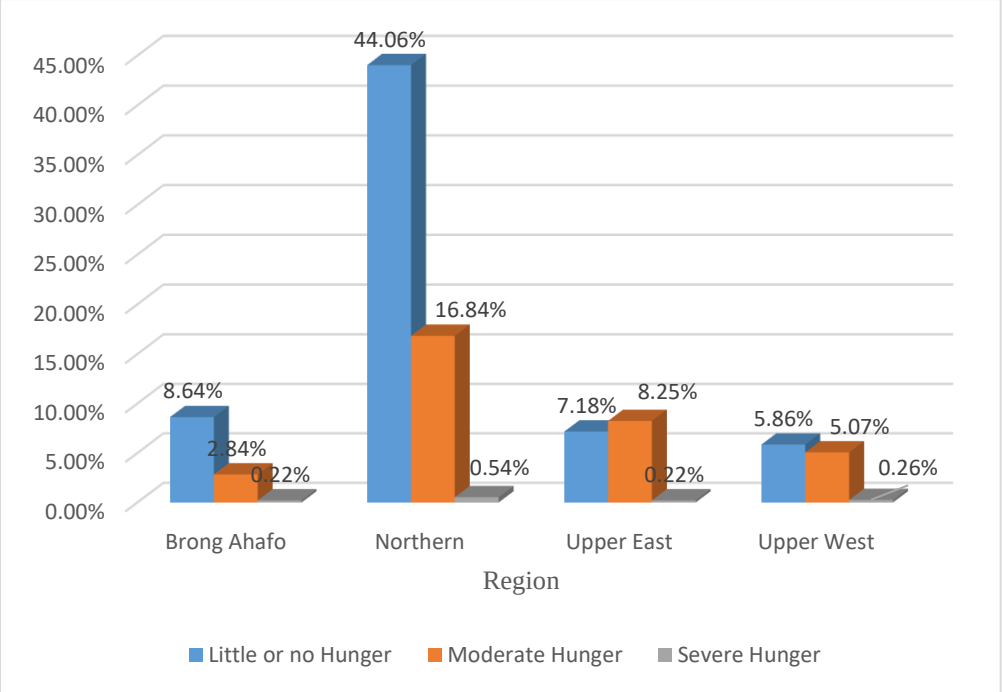

Figure 12: Food security status by region
Source: Author's construct

From Figure 12, it can be seen that Upper West performs poorer in terms of prevalence of severe hunger than Upper East. Moderate hunger was highest in Northern Region (17 percent) than other regions.

Women Empowerment and Food Security in Northern Ghana

This section discusses results generated from the estimation of the panel model. Given that there was not any significant difference in the results generated from the GEE and Random Effect (RE) model, as shown in Appendix E2 and E1, the discussion of the results will be based on the Random Effect estimates presented on Table 11. In this section, Household

Hunger Scale (HHS) which is also a component of experience-based measure of food security is used to measure food security. HHS has been identified as a reliable measure of food security. The HHS is a new simple indicator to measure household hunger in food insecure areas (Ballard et al., 2011). The scale is then recategorised into whether the household suffers moderate to severe hunger or not as a proxy for food security. Due to unavailability of a variable in the dataset to measure the presence of domestic violence or acceptance towards domestic violence in the household, women's empowerment is proxied by two measures: (a) relative years of schooling (measured as years of schooling of woman/partner) and (b) women decision-making (measured as women's participation in household production decision). The next section discusses the results for the women empowerment variables, followed by other covariates used in the estimation.

Women empowerment measures

In this chapter, women empowerment is captured using two main proxies: relative years of schooling (measured as the ratio between years of schooling of the woman and years of schooling of her partner) and women's decision-making in productive activities in the household. Since the coefficients of the normal logistic panel do not represent the magnitude of the effects of the explanatory variables, the odds ratios are discussed. From Table 11, women empowerment, proxied by relative years of schooling, shows that, as relative years of schooling increases by one in the household, the household is 70 percent less likely to experience moderate to severe hunger than not to experience hunger at 10 percent level of significance (p value<0.1). This indicates that a one more year in the years of schooling in the household by

the woman decreases the probability of that household experiencing moderate to severe hunger and thus increasing the probability of not experiencing hunger.

A plausible explanation for this finding is that a higher educational attainment of women could lead to their awareness of the possible advantages of engaging in activities that might improve their living conditions, thereby affecting the household as a whole. This is possible due to the diverse role's women play in households, including the provision of food for household consumption. Thus, reducing illiteracy among women in northern Ghana has a higher probability of improving the state of food insecurity in households. For instance, it has been revealed that household heads who are educated stand a better chance of gaining employment, engaging in technologically advanced method of production, and are able to produce enough to feed themselves and the family (Olumakaiye & Ajayi, 2006; Tefera & Tefera, 2014).

From the results (Table 11), women empowerment, proxied by women's decision-making in household production activities, was significant in explaining household food security. Compared to a household where the woman does not partake in any household decision, a household where women are given the opportunity to engage in decision-making activities are 96 percent less likely to experience moderate to severe food insecurity. Thus, autonomy of women in the household reduces the probability of the household to suffer hunger, thereby improving the state of food security in the household. This is consistent with the work of Amugsi et al. (2016), who argued that women's participation in decision-making regarding household purchases and production is significantly associated with higher household dietary diversity

(Amugsi et al., 2016). Women are more likely to be more rationale, compared to men, in terms of decision-making for allocation of relatively scarce resources (income and food) to maximize the utility or satisfaction of their household families (Dasgupta, 2001; Ibnouf, 2009; Kalabamu, 2006).

Other covariates

This section discusses other explanatory variables used in estimating RE and GEE models. It highlights other household characteristics that influence the state of food security in households in northern Ghana. From the results (Table 11), rural households are 6 percent more likely to be severely and moderately food insecure and less likely to be food secure at 1 percent level of significance (p value < 0.01). This is consistent with empirical works. Even though rural households are noted to be the basic producers of food, the produce ends up at the urban areas, especially during planting and lean seasons where food is scarce in the rural areas with prices soaring.

Also, the level of vulnerability to food insecurity is more on rural than urban households. According to the GSS (2014), the annual average per capita income in urban localities is GH¢7019.72, which implies an average income of GH¢19.23 per person per day, while their counterparts in the rural areas have an average annual income of GH¢3302.83, which represents an average income of GH¢9.04 per person per day. This means that the income of a household in an urban locality is GH¢20, 930.05, while that of a rural household is GH¢11, 408.01 (GSS, 2014; Cooke, Hague, & McKay, 2016; Nkegbe et al., 2017).

The results on Table 11 highlight significant differences between gendered household types in northern Ghana. From the results, households

headed by males are 56 percent less likely to experience moderate to severe hunger and more likely to be food secure than their female counterparts at 1 percent level of significance (p value < 0.01). The number of female-headed households is increasing significantly in rural areas in many developing countries, as rural men migrate due to the lack of employment and other income-generating opportunities. Female-headed households are concentrated among the poorer strata of society and often have lower income than male-headed households. Also, societal pressures and lack of recognition for single women prevent them from engaging in other communal activities (Felker-Kantor & Wood, 2012; Jung, de Bairros, Pattussi, Pauli, & Neutzling, 2017; Mwawuda & Nyaoke, 2015; Omuemu, Otasowie, & Onyiriuka, 2012).

In addition to the above, Seid (2007) reports that, in the Amhara region of Ethiopia, household food insecurity varies inversely with male headship, educational attainment of household head, agricultural productivity of the household, gifts and remittances, livestock ownership, and share of food in total household expenditure but positively with household size and age of the household head. In particular, the study notes that a one percent increase in the number of years of education of the male household head and the number of livestock results in 0.661 and 0.002 percent reduction in the odds of being food insecure. However, same cannot be said for female-headed households (Seid, 2007).

Furthermore, Kassie, Ndiritu, and Stage (2014) studied the determinants of gender inequality and household food security in Kenya. Using an exogenous switching treatment regression technique which enabled them to account for heterogeneities in male-headed and female-headed

households, they observed that there exist important gender-specific factors that make female-headed households to be less food secure, compared to male-headed households, even though both groups have similar observed characteristics. Results concerning the determinants of female-headed households' food security suggest that female-headed households' food security increases with social network size, membership in farmers' association, use of improved seeds, fertiliser adoption, location in a favourable agro-ecological zone, family size, savings, household and farm assets, and age of the household head, while livestock size, distance to major market centre, off-farm income, distance to water source, and distance to agricultural extension office had negative effects on food security (Kassie, Ndiritu, & Stage, 2014).

Dzanku and Sarpong (2011) found that there exists a significant negative relationship between household food security and gender of household head. The study found that female-headed households were more likely to experience food insecurity, compared to male-headed households. A plausible explanation for this could be due to differences in agricultural assets endowment, which tends to be skewed in favour of older males than females (Bempomaa, 2014).

Furthermore, Onasanya and Obayelu (2016) investigated the determinants of food security among maize-based farming households in Nigeria and found that maize output, gender, primary occupation, and farming experience had a positive influence on food security status while age had a negative influence on the food security status. Results also showed that male-headed households were food secure than those headed by females. They also

underscore the importance of making age- and gender-specific programmes an integral part of food security and rural development policies in developing countries, as this is one the surest ways to better the food security status of the vulnerable, aging, and female-headed households (Onasanya & Obayelu, 2016).

Abo and Kuma (2015) studied the determinants of food security in the Wolaita Sodo Town in Ethiopia. Unlike other studies, they focused on only female-headed households in urban areas and used the logit model. Results show that food security is statistically significantly related to the age and level of education of the household head, health status of the household head, household size, ownership of consumer durable and productive assets (including farmland), number of active household members, and backyard gardening. Unfortunately, access to credit, employment status of the household head, and ownership of a savings account, remittances, and sum of monthly income of all household members were not significant in predicting food security.

Contrary to conventional wisdom that households headed by unmarried people and women are more food insecure, other studies have advanced our knowledge that such households can achieve very high levels of household food security if they have equal access to the productive resources, including farmland, credit, and education. Moreover, they found a significant positive relationship between household food security and income as well as access to credit to be factors affecting food security.

Compared with Upper East, the results in Table 11 show that Upper West residents are 55 percent more likely to be food insecure. The three

northern regions (Upper East, Upper West, and Northern Region) are the poorest in Ghana, with Upper West Region being the hardest hit, followed by the Upper East Region (GSS, 2014). Upper West Region is the worst affected by food insecurity, as it experiences a food shortage period (Quaye, 2008). Compared with Upper East Region, residents in Brong-Ahafo Region are 26 percent less likely to experience moderate to severe food insecurity at 1 percent level of significance (p value <0.01) while Northern Region is also 33 percent less likely to experience moderate to severe food insecurity at 1 percent level of significance, compared with Upper East. Thus, residence in Brong-Ahafo and Northern Regions are more food secure than their counterparts in Upper East Region. This assertion is not surprising, as the then Brong-Ahafo, for instance, is known to be the "food basket" of Ghana. Agriculture is one of the main economic activities in the region. The region also produces cash crops like cashew, timber, coffee, rubber, and tobacco. The main food crops produced in the region are maize, beans, cassava, yam, cocoyam, plantain, rice, and tomatoes (Van der Geest, 2011).

Group membership of women is statistically significant in explaining food security in northern Ghana. A household with a woman being a member of a social group, compared with other households without group membership, is 84 percent less likely to experience moderate to severe hunger at 5 percent level of significance (p value <0.05). For instance, this finding supports the work done by Chriest (2017) on the role of community social capital on acute food security. Following an extreme weather event, he concluded that social capital, proxied by community membership, helps in improving acute food security needs even after extreme weather event (Chriest, 2017). Group

membership extends the social networks of individuals, and this allows for information and resource sharing, which eventually improves economic welfare. These groups are important in the agrarian rural areas, as they serve as channels through which the members accessed farm inputs and agricultural extension services (Dzanja, Christie, Fazey, & Hyde, 2013).

Household access to land was highly significant in explaining food security. From the results in Table 11, it is evident that a household with access to land, compared to another which does not, is 49 percent less likely to be food insecure. The finding supports empirical works over the years of a consistent positive relationship between access to land and household food security. For instance, a work done by Muraoka, Jin, and Jayne (2018) showed a significant relationship between land access and food security and hence advocated the improvement in land rental marketing strategies in Kenya. Other empirical works such as Baiphethi and Jacobs (2009), Verburg, Mertz, Erb, Haberl, and Wu (2013), have all underscored the importance of land ownership to household food security.

The findings also support the work of Yami et al (2013), who advanced that the amount of arable land that peasant households in Ethiopia tend to own and operate has serious implications on their productivity and food security status. Because most agricultural households often engage in subsistence farming, the size of farmland they own and use has a significant contribution towards their production and food security situation. Yami et al. (2013) maintained that, as both producers and consumers, peasant households have to maximise production from available resources to meet the food requirements of their members and to accumulate household assets through

minimal sale of surplus produce. This makes farm size an important factor to household food security (Yami et al., 2013).

Feleke, and Zegeye (2006) also argued that the likelihood of agricultural households experiencing food insecurity is explained more by supply-side factors such as farm size, land ownership, and access to inputs. The major policy implication of this study is that food security in developing countries, in general, and among poor households, in particular, originates more from physical food production and distribution. Thus, expanding the capacities of poor households in developing countries to access food, preferably from production from their own plots, could contribute to a significant reduction in the probability of being food insecure and poor (Feleke & Zegeye, 2006).

Similarly, Fisseha (2014) identified three comparative clusters of households on the basis of their food security status and assets possessions: (a) the food secure, (b) food insecure without hunger, and (c) food insecure with hunger. The food secure cluster had more household assets, including land, livestock, and consumer durable than the rest. This group was also the smallest in terms of the number of households falling into it, compared to the last cluster, which was dominated by landless households, reflecting the significant positive association between landholdings and household food security.

Harris-Fry et al. (2015) examined the determinants of food security and women's dietary diversity among households in the rural areas of Bangladesh. They employed cross-sectional data on households drawn from nine unions in three districts and the multinomial logistic analysis. They stated

that land ownership, adjusted relative risk ratio, livestock ownership, women's literacy (measured by ability to read), and access to media all significantly reduced the risk of food insecurity while household size significantly and positively increased it. Moreover, households with vegetable gardens, higher household income, and literate women were significantly more likely to have better dietary scores, compared to their counterparts without such capitals.

Availability of cooking fuel in households was positive and significant in explaining household food security at 5 percent level of significance (p value < 0.05) (Table 9). Thus, compared to a household that has no cooking fuel, households with cooking fuel are 98 percent less likely to experience moderate to severe food insecurity than not to experience food insecurity. Poor access to cooking fuel leads to reallocation of household resources from food production and preparation to fuel procurement. Scarcity of household cooking fuel may also force household members to spend less time in productive and income-generating activities, including agriculture and food production. The meagre income may be spent on purchasing fuelwood rather than on food purchase, thereby increasing their chances of being food insecure (Köhlin, Sills, Pattanayak, & Wilfong, 2011; Makungwa, Epulani, & Woodhouse, 2013; Sola, Ochieng, Yila, & Iiyama, 2016) .

Access to water by households is significant and positively correlated with food security. Households with access to water were 98 percent less likely to experience moderate to severe hunger than their counterparts without water access. For instance Hanjra and Qureshi (2010) asserted that water for food security situation is necessary and, therefore, recommended the need for

investment in water conservation and responding to other global challenges that may affect the state of food security (Hanjra & Qureshi, 2010).

The study suggested a negative relationship between household size and food security (Table 11). The result shows that an additional increase in the number of household members leads to 2 percent likelihood of experiencing moderate to severe hunger. This assertion supports other empirical works. The chances for larger household size to be poor are high and hence add more pressure on the resources of the household in terms of the number of people the household is required to feed (Ajuruchukwu & Sanelise, 2016; Ngema, Sibanda, & Musemwa, 2018; Sekhampu, 2013).

Table 11: Results of random effects logistic regression

Moderate-severe	Odds Ratio	Std. Err.	Z	P>z	[95% Conf.	Interval]
Relative years of schooling	.7018505	.1268798	-1.96	0.050	.4924536	1.000285
Decision making	.9575574	.0102934	-4.03	0.000	.9375937	.9779462
Male head	.5600318	.0797973	-4.07	0.000	.4235722	.7404538
Rural	1.062893	.0241521	2.68	0.007	1.016594	1.1113
Water presence	.9821072	.0051473	-3.44	0.001	.9720702	.9922478
Land	.4940942	.0532908	-6.54	0.000	.3999475	.6104028
Reg						
Upper West	1.549584	.2500404	2.71	0.007	1.129446	2.126007
Brong Ahafo	.2666021	.0333132	-10.58	0.000	.2086901	.3405847
Northern	.328426	.0472511	-7.74	0.000	.2477274	.4354125
In group	.8448792	.0671175	-2.12	0.034	.7230609	.9872211
Age	.8718326	.0304083	-3.93	0.000	.8142249	.9335162
Access to cooking fuel	.9780668	.0103542	-2.09	0.036	.957982	.9985727
Household size	1.019627	.0105761	1.87	0.061	.9991074	1.040568
Engaged in farming	.8755363	.084443	-1.38	0.168	.7247333	1.057719
Self-own	1.01864	.0929111	0.20	0.840	.8518864	1.218034
_cons	26.53379	10.39841	8.37	0.000	12.3089	57.19778
/lnsig2u	-1.004957	.6177512			-2.215727	.2058128
sigma_u	.6050291	.1868787			.3302638	1.108388
Rho	.1001279	.0556608			.0320906	.2718939

Appendix E3 highlight results from the multivariate decomposition. The technique uses the output from regression models to divide the components of a group difference in a statistic, such as a mean or proportion, into a component attributable to compositional differences between groups (that is, differences in characteristics or endowments) and a component attributable to differences in the effects of characteristics. From the RE estimates in Table 11, it is established that there exists a difference in hunger between male-headed and female-headed households.

This assertion is confirmed in Appendix E2, as females performed worse than their male counterparts. The result shows that the significant differences in hunger status between male-headed and female-headed households are attributed to both explained characteristics and unexplained characteristics. The results from this technique show that relative education, women's decision, water, and location (rural) were the significant observable characteristics that influenced food security (Appendix E3). The results show that, if female-headed households are given the same opportunity available to their male counterparts, especially for education and decision-making, the probability for them to experience moderate to severe hunger will fall by 9.3 and 3.3 percent respectively.

Availability of water in the household will also reduce the rate of food insecurity in female-headed household by 2 percent. Appendix E3 results show that the dominant unobserved characteristic that has a significant effect on food security status between male and female is women's decision-making. This means that, if women are allowed to actively partake in decision-making, the probability for them to experience moderate to severe hunger falls by 46

percent. Based on the results from the Hausman test (Prob>chi2 =0.2959) as presented in the appendix and duly discussed in the methodology, the RE is chosen over FE.

Chapter summary

This chapter presented results and discussion of women empowerment and household food security in the northern part of the country. The results suggest that women empowerment, proxied by relative years of schooling and decision-making, as well as other household variables such as access to land, water, and cooking fuel, were significant indicators for improving food security. The decomposition results revealed that household observable characteristics such as relative education can reduce the rate of food insecurity by 9.3 percent. The next chapter provides the summary of the findings from the three empirical chapters (Chapters 5, 6 and 7). Conclusions are drawn from the findings, followed by policy recommendation and suggestions for future research.

CHAPTER EIGHT

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

In spite of the various initiatives implemented by the Government of Ghana to end hunger and improve food and nutrition security among children and households, statistics over the years show that Ghana is not free from the prevalence of hunger and malnutrition among children. Based on GDHS data, 2014, 19 percent of children under-five in Ghana were stunted, with 11 percent underweight. However, despite the significant successes experienced by the country over the years, there exist regional disparities, with poverty and food insecurity dominating in the northern part of the country. With these backdrops, the issue of food security and nutrition among children has become a legitimate concern. This study, therefore, sought to investigate issues on women empowerment, nutritional status of children, and household food security in Ghana. This chapter provides the summary, conclusions, and recommendations from the study as well as suggestions for future research.

Summary

This study sought to investigate issues of women empowerment on nutritional status of children and household food security in Ghana. The thesis provides knowledge on how women empowerment can help mitigate food insecurity in the country and also improve the nutritional status of children below the age of five. Three major thematic areas were considered: (a) women empowerment and nutritional status of children under the age of five, (b) women empowerment and food security in Ghana, and (c) women

empowerment and food security in northern Ghana. Quantitative approach was adopted for the study.

In the first empirical chapter, two hypotheses were tested: (a) Varying dimensions of women empowerment have a significant effect on the child's nutritional status at different points in its conditional distribution and (b) The joint effect of women empowerment and food security has a significant effect on child's nutritional status. A nationally representative household data by the Ghana Statistical Service on demographic and health issues of both women and children was used. With a sample size of 1,616 children under the age of five, Quantile regression, Ordinary Least Square, and Instrumental Variable estimation models were used to estimate the effect of women empowerment on child health at the different points in its conditional distribution.

The findings from the study suggested that the effect of women empowerment on child nutrition differs across the different categories of child health. Hence, the use of OLS may lead to an invalid conclusion. This is because it was realised that the effect women empowerment had on moderately malnourished children was not the same as it had on acutely malnourished children. Also, it was realised that food security is an essential household characteristic needed for the improvement of child health outcomes. Interestingly, the study revealed that, even in situations where the household is food secured yet there exists a lack of women empowerment manifested through acceptance towards domestic violence, the child's health is negatively affected. Other drivers that the study revealed as necessary for improving child health outcomes included mother's occupation, access to health insurance, and presence of water in households.

The second empirical analysis focused on the effect of women empowerment and household food security in Ghana. Two hypotheses were tested: (a) The probability of a household to move from a worse state of food insecurity to a mild state increases with increasing levels of women empowerment, and (b) varying levels of women empowerment have a significant effect on food security in the household. Using household level data from Ghana Living Standards Survey (GLSS 7), the study provided an objective analysis into how women empowerment could help improve the state of food security in the household. With a sample size of 1,017, the Generalized Ordered Logit margins capturing varying dimensions of women empowerment on food security status of the household and dominance analysis were used to establish the relationship between women empowerment and household food security.

The findings from this analysis revealed that women's empowerment, proxied by relative years of schooling and women's decision-making, was a critical indicator for improving household food security. The dominance analysis indicated that, in order to solve the issue of food insecurity in the country, the most dominant women empowerment variables worthy of attention is education and women's participation in household decision-making. However, domestic violence on the other hand was not statistically significant in explaining food security in Ghana. Other drivers that were found to be necessary for improving household food security in the household included involvement in agricultural productivity, household expenditure, and household size.

Given the high levels of poverty and food insecurity in the northern part of the country, the third chapter sought to investigate this issue using a panel data in northern Ghana, funded by the Government of Ghana and United State Agency for International Development (USAID), FTF, 2012 and 2015. The objective of this data was to find out how empowerment can help improve food and nutrition situations in households in northern Ghana. The study, therefore, employed the two rounds of this dataset since it is in line with the objective of the study. The hypothesis tested in this chapter was that the probability of a household becoming vulnerable to food insecurity in Northern Ghana decreases with increasing levels of women's empowerment.

Using a sample size of 3,768 observations, three estimations were done to establish the relationship between women empowerment and household food security as well as determine the sources of differences in household hunger that existed between male-headed and female-headed households. The results from the Random effect model, Generalized Estimating Equation and Multivariate decomposition for non-linear models indicated that women empowerment, proxied by women decision-making and relative years of schooling, was significant in reducing the rate of food insecurity in the household. The results from the decomposition model showed that moderate to severe hunger was prevalent in female-headed households than male-headed households in Northern Ghana, of which an improvement in women's education and decision-making can help reduce this negative effect by 9 and 45 percent respectively. Thus, if women are empowered through education and household decision-making, the state of food insecurity in such households will reduce by 9 and 45 percent respectively. Other household

variables that were significant in explaining hunger in the households in northern Ghana included women group membership, household access to land, household size, access to cooking fuel, and access to water.

Conclusions

The finding from the study deepens the understanding into factors necessary for improving the health of children and also provides the determinant of factors that affect different categories of child health. In addition to women empowerment, food security is one of the critical indicators necessary for improving the nutritional status of children under the age of five. The results of the second empirical chapter on women empowerment and food security and the effect of varying dimensions of women empowerment on household food security as well as dominance analysis to capture the most dominant women empowerment variables suggested that women empowerment, proxied by improvement in women decision-making and education, is critical if issues of food insecurity in the household are to be addressed followed by issues on domestic violence.

On the hypothesis relating to whether the probability of a household becoming vulnerable to food insecurity in northern Ghana decreases with increasing levels of women's empowerment, the study suggested a similar trend on women decision-making and education contributing significantly to improving the food security status in the northern part of the country.

Overall, the three empirical chapters have suggested issues of concern for child nutritional status and household food security. There is no doubt that women empowerment is highly significant in improving the state of household food security and nutritional status of under-fives, probably due to the diverse

roles played by women at the household level, including cooking, taking care of children, and managing activities in the households. It is hoped that discrimination against women in the society will be eradicated in order to achieve overall economic development and welfare in households.

Recommendations

Based on the empirical evidences and conclusions from the study, the following recommendations are made for consideration by the following Ministries, namely Ministry of Agriculture, Ministry of Health, Ministry for Gender and Social Protection, and Ministry of Education in Ghana. In addition, the recommendations will also be helpful to other international bodies such as UNICEF which are involved in ensuring improvement in child health and women's development. The following policy recommendations are drawn:

1. Ministry of Gender and Social protection should intensify campaign against acceptance towards domestic violence and educate male partners on the need for women's participation in decision making at the household level.
2. Sponsorship packages should be provided by the Ministry of Education for women and girls to further their education.
3. Ministry of Gender and Social Protection should encourage the formation of local social groups for women, as these groups serve as a learning ground for women and also enhance their involvement in decision-making.

4. Gatekeepers, such as queen mothers, opinion leaders and unit committee heads should be involved in the campaign against acceptance towards domestic violence at the household level.

Suggestions for future research

From the operationalisation of the problem, the study has benefited from varying suggestions from other researchers and departmental seminars. However, due to time constraint and resource availability, the study may not have addressed all issues and hence recommend the following for future research:

First empirical analysis

- Examine rigorously how father's role in the households would affect the nutritional status of children under the age of five.
- Explore the interactive effect of mother's income and empowerment and how it affects child health
- Policy interventions such as access to credit and its effect on child malnutrition should be subjected to rigorous analysis to know how these interventions impact on child health outcome.

Second empirical analysis

- Estimate the effect of women empowerment on food security nationwide using a panel data.

Third empirical analysis

- Explore how varying dimensions of social capital in the northern part of the country can impact both child nutrition and household food security in northern Ghana.

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APPENDICES

Appendix A- Questions for food insecurity experience scale from GLSS 7

	During the last 12 MONTHS:	Code "Yes" = 1" "No"= 0
1	Was there a time when you or others in your household worried about not having enough food to eat because of a lack of money or other resources?	
2	Still thinking about the last 12 MONTHS, was there a time when you or others in your household were unable to eat healthy and nutritious food because of a lack of money or other resources?	
3	Was there a time when you or others in your household ate only a few kinds of foods because of a lack of money or other resources?	
4	Was there a time when you or others in your household had to skip a meal because there was not enough money or other resources to get food?	
5	Still thinking about the last 12 MONTHS, was there a time when you or others in your household ate less than you thought you should because of a lack of money or other resources?	
6	Was there a time when your household ran out of food because of a lack of money or other resources?	
7	Was there a time when you or others in your household were hungry but did not eat because there was not enough money or other resources for food?	
8	Was there a time when you or others in your household went without eating for a whole day because of a lack of money or other resources?	

Appendix B1- Empirical Analysis (1)

Variables	Definition and Measurement	A - priori
Child nutritional status	Measured using the anthropometric indictor Height-for-age and weight-for-age	
Relative years of schooling	Mother's years of schooling/ father's years of schooling (continuous)	+/-
Decision on health	Whether the mother is given the opportunity to make decision regarding the health of the child; binary (1= yes, 0=no)	+/-
Acceptance towards domestic violence	Whether beating is justified if the mother neglects her responsibility towards the child; binary (1= yes, 0=no)	-
Food secured	Whether the household is food secured; binary (1 for food secured, 0 for food insecure)	+
Age of child	Measured in months (continuous)	
Squared of child age	Square of age of child to determine increasing effect of age (continuous)	+/-
Health insurance	Whether a member in the household has access to health insurance; binary (1=yes, 0=no)	+
Flush toilet	Whether the household has a toilet facility. It was used a proxy for sanitation; binary (1=yes, 0=no)	+/-
Mother's occupation	Categorical; whether she is not working as against whether she is working at the service sector or engaged in any manual	+/-
Presence of radio	Whether the household has access to radio. It was used as a proxy for source of information on child heath	+/-
Household size	Number of household members (continuous)	-/+
Age of the mother	Mother's age measured in years as a continuous variable	
Squared of age	Square of age to determine increasing effect of age (continuous)	+/-
Time to water source	Measured in minutes (continuous variable)	-
Ecological zones	Regions categorised into zones	+/-
Birth order	Categorical	+/-

Appendix B2: Empirical Analysis (2)

Variables	Definition and Measurement	A-priori
Food security	Ordinal; measured using food insecurity experience scale	
Relative years of schooling	Mother's years of schooling/ father's years of schooling (continuous)	+
Decision making on use of resource	Whether the woman makes decision on the use of resource	+
Domestic violence	Whether the household is free from any form of violence; binary (1= violence; 0= no violence)	-
Engaged in farming	Whether the household is engaged in any agricultural form productivity	+
Non-food expenditure	Measured as a continuous variable	
Household size	Number of household members. Measured as a continuous variable	+/-
Age		
Household expenditure on water	Amount spent on water. Measured as a continuous variable	-
PWD	Whether the household has a member with disability; binary (1=yes, 0=no)	-
Ecological zones	Regions categorised into zones	+/-

Appendix B3: Empirical Analysis (3)

Variables	Definition and Measurement	A-priori
Moderate to severe food insecurity	Dummy variable (1= Moderate to severe, 0= no hunger/ food secure)	
Relative years of schooling	Mother's years of schooling/ father's years of schooling (continuous)	-
Women decision making	Woman input in decision making (Dummy: 1=yes, 0=No)	-
Male head	Sex of household head (Dummy:1=Male; 0 =female)	-/+
Rural	Locality (Urban=0 Rural=1)	+
Presence of water	Whether there is water in household (Dummy: 1=yes, 0=No)	-
Access to land	Whether the household has access to land (Dummy: 1=yes, 0=No)	-
Regions	Upper East, West, Northern and Brong-Ahafo	-/+
Group member	Whether the woman belongs to a group (Dummy; Yes=1,0=No)	-
Age	Age of household head (continuous)	-/+
Household access to cooking fuel	Whether the household has access to any traditional source of cooking fuel (Dummy: 1=yes, 0=No)	-
Household size	Number of household members (continuous)	-/+
Engaged in farming	Whether the household is engaged in farming activities (Dummy: 1=yes, 0=No)	-
Self-own	Whether the woman own any of the household assets (Dummy: 1=yes, 0=No)	-

Appendix C1: Instrumental variable results (first stage) of women empowerment on stunting

Relative years of schooling	Coef.	Robust Std. Err.	T	P>t	[95% Conf.	Interval]
Knowledge on contraceptive	.2049184	.1099045	1.86	0.062	-.0106545	.4204914
Number of wives	-.0060318	.0016117	-3.74	0.000	-.0091931	-.0028704
Average years of schooling	-.0362712	.0103836	-3.49	0.000	-.0566382	-.0159043
Decision making	.1684229	.091057	1.85	0.065	-.0101816	.3470274
Domestic violence	.1785123	.1065064	1.68	0.094	-.0303954	.38742
Food secured	.3813641	.3535468	1.08	0.281	-.3121027	1.074831
Domestic with violence	-.3766881	.298893	-1.26	0.208	-.9629539	.2095777
Food secured with decision	-.240426	.3340558	-0.72	0.472	-.8956622	.4148101
Age of child	.1142521	.0885789	1.29	0.197	-.0594915	.2879958
Squared of age	-.0172348	.0226956	-0.76	0.448	-.0617512	.0272816
Health insurance	-.0050732	.0842469	-0.06	0.952	-.17032	.1601735
Toilet facility	-.0698582	.0264791	-2.64	0.008	-.1217958	-.0179205
Mother's occupation						
Base (Not employed)						
Service	.2274805	.1183493	1.92	0.055	-.0046564	.4596175
Manual	.0523021	.0978403	0.53	0.593	-.1396075	.2442116

Male child	.0616664	.0769031	0.80	0.423	-.0891757	.2125085
Presence of radio	-.0230406	.0896137	-0.26	0.797	-.198814	.1527327
Household size	-.0304757	.0172667	-1.76	0.078	-.0643436	.0033922
Age of mother	.0557544	.0431688	1.29	0.197	-.0289194	.1404282
Squared of age	-.0010274	.0006182	-1.66	0.097	-.00224	.0001852
Time to water	.0036712	.0026883	1.37	0.172	-.0016019	.0089442
Zones						
Base: Forest Zone						
Coastal	-.0769803	.0878503	-0.88	0.381	-.2492949	.0953343
Savannah	.1466564	.1146702	1.28	0.201	-.0782643	.3715771
Birth order						
Second birth	-.0755186	.1225626	-0.62	0.538	-.3159198	.1648826
Third birth	-.0576257	.1373517	-0.42	0.675	-.3270351	.2117837
Fourth birth	-.0588561	.1603985	-0.37	0.714	-.373471	.2557587

Appendix C2: Instrumental variable results (first stage) of women empowerment on underweight

Table 16: Test for instrument for underweight

Relative years of schooling	Coef.	Robust Std. Err.	T	P>t	[95% Conf.	Interval]
Knowledge on contraceptive	-.238622	.0810395	-2.94	0.003	-.3975775	-.0796665
Number of wives	-.0067275	.0016865	-3.99	0.000	-.0100356	-.0034195
Average years of schooling	-.0277182	.0106701	-2.60	0.009	-.0486471	-.0067892
Decision making	.1633857	.0913667	1.79	0.074	-.0158261	.3425976
Domestic violence	.2023719	.1064774	1.90	0.058	-.006479	.4112228
Food secured	.3879511	.3520263	1.10	0.271	-.3025335	1.078436
Food secured with violence	-.3511711	.2984624	-1.18	0.240	-.9365922	.2342501
Food secured with decision	-.2847001	.3366643	-0.85	0.398	-.9450527	.3756525
Age of child	.1094323	.0891453	1.23	0.220	-.0654224	.284287
Squared of age	-.0159011	.0227219	-0.70	0.484	-.0604691	.0286669
Health insurance	.0007102	.0850791	0.01	0.993	-.1661688	.1675892
Flush toilet	-.07914	.0301856	-2.62	0.009	-.1383477	-.0199323
Mother's occupation (base: not employed)						
Service	.2425818	.119434	2.03	0.042	.008317	.4768466
Manual	.0532754	.0977288	0.55	0.586	-.1384155	.2449663
Male child	.0498328	.0770383	0.65	0.518	-.1012747	.2009402
Radio	-.0024007	.0889553	-0.03	0.978	-.1768827	.1720812
Household size	-.0274656	.0173063	-1.59	0.113	-.0614111	.0064799
Mother's age	.0528908	.0440614	1.20	0.230	-.0335338	.1393155
Squared of age	-.0009637	.0006303	-1.53	0.126	-.0022	.0002727
Time to water	.0034347	.002725	1.26	0.208	-.0019104	.0087797

Table 16 Cont'D

Zones : base (Forest)						
Coastal	-.0753999	.0881874	-0.85	0.393	-.2483756	.0975758
Savannah	.1184805	.114699	1.03	0.302	-.1064966	.3434577
Birth order						
Second birth	-.0754119	.1237033	-0.61	0.542	-.3180507	.1672269
Third birth	-.0692244	.1365602	-0.51	0.612	-.3370813	.1986325
Fourth birth	-.0705613	.1595903	-0.44	0.658	-.3835908	.2424682
_cons	.5015279	.6973877	0.72	0.472	-.8663682	1.869424

Appendix C3: Instrumental variable results (first stage) of women empowerment on underweight

Table 17: Full model for Instrumental variable results

Variables	Stunting	Underweight
Relative years of schooling	0.239	-0.382
	(0.192)	(0.243)
Average years of schooling	0.0301***	0.01000
	(0.0107)	(0.0123)
Decision on child health	0.159**	0.188**
	(0.0772)	(0.0798)
Domestic violence	-0.0621	0.0487
	(0.0845)	(0.0905)
Food security	0.271	0.277
	(0.210)	(0.245)
Domestic violence and food security	-0.353	-0.314
	(0.226)	(0.232)
Food security without auto	-0.189	-0.255
	(0.226)	(0.254)
Age of child	-0.960***	-0.273***
	(0.0801)	(0.0781)
Squared of child age	0.184***	0.0537***
	(0.0181)	(0.0177)
Health insurance	0.212***	0.208***
	(0.0692)	(0.0680)
Flush toilet	0.0249	0.0217
	(0.0289)	(0.0417)
Occupation		
Service	0.0323	0.0548

Table 17 Cont'D

	(0.0926)	(0.101)
Manual	0.0537	-0.0651
	(0.0785)	(0.0784)
Male child	-0.0873	0.0397
	(0.0616)	(0.0604)
Radio	0.192***	0.0638
	(0.0686)	(0.0685)
Household size	-0.00130	-0.0161
	(0.0148)	(0.0161)
Woman age	0.0239	0.0345
	(0.0418)	(0.0441)
Squared of age	9.57e-05	-0.000425
	(0.000633)	(0.000658)
Time to water source	-0.00778***	-0.00309
	(0.00194)	(0.00217)
Zones		
Coastal	0.00100	-0.0652
	(0.0796)	(0.0769)
Savannah	-0.0289	-0.0943
	(0.0817)	(0.0862)
Second birth	0.138	0.0461
	(0.0994)	(0.103)
Third birth	-0.0574	0.0579
	(0.115)	(0.115)
Fourth birth	-0.273**	-0.0515
	(0.126)	(0.134)
Constant	-1.593**	-0.957
	(0.634)	(0.658)
Observations	1,616	1,616

Table 17 Cont'D

Hansen J Statics	0.3590	0.5199
Endogeneity test	0.0782	0.0563
Observation	1,616	1,616

APPENDIX D

Appendix D1: Women empowerment and household food insecurity

Generalized Ordered Logit Estimates — Number of obs = 1,017

LR chi2(22) = 101.97

Prob > chi2 = 0.0000

Log likelihood = -1023.3267 — Pseudo R2 = 0.0475

Table 18

Food insecurity	Coef.	Std.Err.	Z	P>z	[95%Conf.	Interval]
Mild food insecurity						
Relative years of schooling	0.142	0.075	1.900	0.057	-0.004	0.288
Domestic violence	-0.682	0.947	-0.720	0.472	-2.539	1.175
Engaged in farming	0.547	0.206	2.660	0.008	0.144	0.951
Non-food expenditure	-0.001	0.000	-4.650	0.000	-0.001	-0.000
Decision making	0.474	0.342	1.380	0.166	-0.197	1.145
Household size	0.094	0.043	2.220	0.027	0.011	0.178
Age	-0.006	0.007	-0.780	0.433	-0.020	0.008
Expenditure on water	0.000	0.000	2.320	0.020	0.000	0.000
disability						
No PWD	0.087	0.722	0.120	0.904	-1.328	1.502
Zones						
Coastal	-0.064	0.185	-0.350	0.728	-0.428	0.299

Savannah	-0.485	0.212	-2.290	0.022	-0.900	-0.070
_cons	0.617	0.853	0.720	0.470	-1.056	2.289
Moderate food insecurity						
Relative years of schooling	-0.079	0.044	-1.770	0.077	-0.166	0.008
Domestic violence	-0.574	1.134	-0.510	0.612	-2.796	1.648
Engaged in farming	0.534	0.157	3.390	0.001	0.225	0.842
Non-food exp	-0.001	0.000	-4.110	0.000	-0.001	-0.000
Autonomy	0.512	0.306	1.670	0.094	-0.088	1.113
Household size	0.014	0.035	0.420	0.678	-0.053	0.082
Age	-0.014	0.006	-2.260	0.024	-0.026	-0.002
Expenditure on water	0.000	0.000	1.540	0.124	-0.000	0.000
Disability						
No PWD	1.855	1.055	1.760	0.079	-0.213	3.924
Zones						
Coastal	-0.513	0.159	-3.220	0.001	-0.826	-0.201
Savannah	-0.110	0.186	-0.590	0.555	-0.474	0.255
cons	-2.189	1.131	-1.940	0.053	-4.406	0.028

APPENDIX E

Appendix E1: Women empowerment and household food insecurity in Northern Ghana

Table 19: Random-effects logistic regression

Moderate to severe hunger	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Relative years of schooling	-0.354	0.181	-1.96	0.050	-0.708	0.000	*
Decision making	-0.043	0.011	-4.04	0.000	-0.064	-0.022	***
Male headed	-0.580	0.142	-4.07	0.000	-0.859	-0.300	***
Rural	0.061	0.023	2.68	0.007	0.016	0.106	***
Water presence	-0.018	0.005	-3.44	0.001	-0.028	-0.008	***
Access to land	-0.705	0.108	-6.54	0.000	-0.916	-0.494	***
Upper West	0.438	0.161	2.71	0.007	0.122	0.754	***
Brong-Ahafo	-1.322	0.125	-10.58	0.000	-1.567	-1.077	***
Northern	-1.113	0.144	-7.74	0.000	-1.395	-0.831	***
Group member	-0.169	0.079	-2.12	0.034	-0.324	-0.013	**
Age	-0.137	0.035	-3.93	0.000	-0.206	-0.069	***
Access to cooking fuel	-0.022	0.011	-2.10	0.036	-0.043	-0.001	**
Household size	0.019	0.010	1.87	0.061	-0.001	0.040	*
Engaged In farming	-0.133	0.096	-1.38	0.168	-0.322	0.056	
Self own	0.018	0.091	0.20	0.840	-0.160	0.197	
Constant	3.278	0.392	8.37	0.000	2.510	4.047	***

lnsig2u	-1.005	0.618	.b	.b	-2.216	0.206
Number of obs		3768.000	Chi-square			227.792
Prob > chi2		0.000	Akaike crit. (AIC)			4500.240

*** *p<0.01*, ** *p<0.05*, * *p<0.1*

Hausman Test

b = consistent under Ho and Ha; obtained from xtlogit

B = inconsistent under Ha, efficient under Ho; obtained from xtlogit

Test: Ho: difference in coefficients not systematic

chi2(15) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 17.39

Prob>chi2 = 0.2959

Appendix E2: Women empowerment and household food security in northern Ghana

Table 20: Generalised estimating equation

Moderate to severe	Coef.	Robust Std. Err.	Z	P>z	[95% Conf.	Interval]
Relative years of schooling	-.3271513	.1658815	-1.97	0.049	-.6522729	-.0020296
Decision making	-.0401784	.0120599	-3.33	0.001	-.0638154	-.0165414
Male headed	-.5291516	.1374356	-3.85	0.000	-.7985203	-.2597828
Rural	.060109	.0225779	2.66	0.008	.015857	.1043609
Water presence	-.0167417	.004746	-3.53	0.000	-.0260437	-.0074398
Land	-.6691456	.098872	-6.77	0.000	-.8629311	-.4753601
Reg						
Upper West	.4218631	.1580633	2.67	0.008	.1120648	.7316615
Brong Ahafo	-1.218726	.104788	-11.63	0.000	-1.424106	-1.013345
Northern	-1.033172	.1266634	-8.16	0.000	-1.281428	-.7849161
In group	-.1537177	.0744276	-2.07	0.039	-.2995931	-.0078423
Age	-.1283348	.0320899	-4.00	0.000	-.1912298	-.0654398
Access to cooking fuel	-.0210037	.0155951	-1.35	0.178	-.0515694	.0095621
Household size	.0183822	.0156501	1.17	0.240	-.0122914	.0490557
Engaged in farming	-.1268914	.0915786	-1.39	0.166	-.3063822	.0525994
Self own	.017564	.0867663	0.20	0.840	-.1524948	.1876228
_cons	3.053622	.3572645	8.55	0.000	2.353396	3.753847
Link: logit						
Family: binomial			Wald chi2(15) = 342.57			
Correlation : Exchangeable			Prob > chi2 = 0.0000			

Appendix E3: Multivariate Decomposition

Table 10: Multivariate Decomposition for non-linear model

Hunger scale	Coef	Standard Deviation	P values
Endowment	-.022042	.008687	0.011
Unobserved chac	.13885	.027169	0.000
R	.1168	.025823	0.000
High outcome group: female head==1 Low outcome group: female head==0			

Table 11: Differences in Endowment

Moderate to Severe hunger	Coef	Standard errors	P values	Percentage
Relative years of schooling	-.010816	.0058156	0.063	-9.2598
Decision making	-.0039624	.00061428	0.000	-3.3923
Farming	-.00078745	.0019747	0.690	-.67416
In_group	-.0029062	.0020959	0.166	-2.4881
Age	-.0088385	.0017413	0.000	-7.5669
Rural	.0071381	.0040175	0.076	6.1111
Access to cooking fuel	.00015224	.00015891	0.338	.13034
Water presence	-.0020216	.00047125	0.000	-1.7308

Table 12: Differences in coefficient

Moderate to Severe hunger	Coef	Standard errors	P values	Percentage
Relative years of schooling	.38166	.19329	0.048	326.75
Decision making	-.053715	.028196	0.000	-45.987
Farming	.011036	.029541	0.709	9.4486
In_group	-.0029062	.0020959	0.166	-2.4881
Age	.10359	.068017	0.128	88.689
Rural	14283	.052108	0.006	122.28
Access to cooking fuel	.15842	.083149	0.057	135.63
Water presence	.26869	.11996	0.025	230.03
Cons	-.87332	.25501	0.001	-747.68

APPENDIX F: Growth Problems

Z-score	Growth Indicators			
	Length/height-for-age	Weight-for-age	Weight-for-height/length	BMI-for-age
Above 3	See note 1	See note 2	Obese	Obese
Above 2			Overweight	Overweight
Above 1			Possible risk of overweight (See note 3	Possible risk of overweight (see note3
0 (Median)				
Below -1				
Below -2	Stunted See note 4	Underweight	Wasted	Wasted
Below -3	Severely Stunted (See note 4)	Severely Underweight (see note 5)	Severely wasted	Severely wasted

1. A child in this range is very tall. Tallness is rarely a problem, unless it is so excessive that it may indicate an endocrine disorder such as a growth-hormone-producing tumor. Refer a child in this range for assessment if you suspect an endocrine disorder (e.g. if parents of normal height have a child who is excessively tall for his or her age).

2. A child whose weight-for-age falls in this range may have a growth problem, but this is better assessed from weight-for-length/height or BMI-for-age.

3. A plotted point above 1 shows possible risk. A trend towards the 2 z-score line shows definite.

4. It is possible for a stunted or severely stunted child to become overweight.

5. This is referred to as very low weight in IMCI training modules. (Integrated Management of Childhood Illness, In-service training. WHO, 1997).

6. Measurements in the shaded boxes are in the normal range

Source: WHO (2008); https://www.who.int /child growth /training /module_c_interpreting_indicators.pdf