ASSOCIATION BETWEEN HOUSEHOLD FOOD CONSUMPTION AND DIETARY INTAKE OF CHILDREN (3-6 YEARS) IN THE ASESEWA SUB-DISTRICT

BY

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DECLARATION

I, Isabella Tandoh declare that this thesis is the result of my own effort produced from research under the supervision of Dr. Agartha Ohemeng and Dr. Esi Colecraft. All references to other works have been duly acknowledged.

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ABSTRACT

Background: Household food consumption is a dynamic process that may influence the dietary intake and nutritional status of children living in the household. Children in their first five years are nutritionally vulnerable given their increased energy and nutrient needs. As these children are completely weaned and depend solely on household foods, less attention might be paid to the adequacy and quality of diet as compared to when they were receiving complementary foods.

Objective: Determining the strength of association between household dietary diversity and child dietary diversity was thus the subject of investigation in this study.

Methodology: A cross sectional survey was used to obtain data from 165 caregiver-child pairs from seven (7) randomly selected communities in the Asesewa sub-district. Structured questionnaires were used to solicit information on background characteristics and nutritional knowledge of caregivers; dietary data for the child was obtained using a single 24-hour recall method and a seven (7) day food frequency questionnaire. Household dietary data was also assessed with a seven (7) day food frequency questionnaire. Finally, height and weight measurements of both caregiver and child were taken (using standard procedures) and anthropometric indices (BMI-for-age and height-for-age) were computed. The relationships/associations between the independent variables (household dietary diversity, nutritional knowledge of caregivers) and dependent variables (child dietary diversity, height-for-age and BMI-for-age) were examined using Chi-square test and logistic regression employed to assess the strength of association after accounting for certain factors of interest.

Results: Results indicated that, at least 90% of all households and children consumed more from starchy staples compared to other food groups. Diets were also low in dairy products and

meat products having about 44.2% and 38.8% of participants respectively consuming them. Households had a mean household dietary diversity of 9.88 ± 1.7 out of 12 food groups and about 66% of the households had a high dietary diversity. The mean child dietary diversity was 6.75 ± 1.3 out of 9 food groups, and 58.2% of them were found to have a high dietary diversity. Meals provided by the household contributed to a majority of the children meeting or exceeding the EAR for protein, energy and carbohydrate but few meeting their requirement for vitamin C (27.3%) and calcium (3.6%). The prevalence of stunting (23.6%), underweight (4.2%) and overweight (3%) reported in the study were lower than estimates from national level and other studies. Studies provided evidence of a significant association ($p<0.001$) between household dietary diversity and child dietary diversity but no significant association with nutritional status of the children. Households with high dietary diversity had an almost six-fold likelihood of having children with high dietary diversity compared to households with low dietary diversity (OR: 5.7; CI: 2.78 - 11.84). The nutritional knowledge of the caregivers assessed had a marginal significant association with child dietary diversity ($p=0.05$). There was a tendency for caregivers with high nutritional knowledge to be more likely to have children with high dietary diversity (OR: 1.8; CI: 0.98, 3.44).

Conclusion: The study showed a significant association between household dietary diversity and child's dietary diversity.

DEDICATION

This work is dedicated to the entire Tandoh family for their unfailing love and support throughout this study

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CHAPTER 1

1.0 INTRODUCTION

1.1 Background

Food is a basic necessity of life and every individual needs a minimum amount of it for existence and a balanced diet for proper growth and development (Begum *et al*., 2010). Foods consumed in the household have an influence on an individual's dietary intake and ultimately, the nutritional status. This is because the household may be a determinant of what is eaten, how much is eaten and when it should be eaten at home.

Household food consumption is a dynamic process and greatly influenced by several factors that can affect the dietary intake and nutritional status of children living in the household. Such factors include the socio-economic and demographics of the caregiver (Raper *et al*., 2002) with one of the most important determinants being household monthly income. Household income affects access to food, and the quality of the diet (Al-Mekhlafi *et al*., 2008). This is seen in a study by Kirkpatrick and Tarasuk, (2003) who found that households with low income ($1,317) appeared to purchase and consume significantly fewer servings of vegetables and fruits (85.97 % vs 92.12 %, $p< 0.05$) and milk products (87.72% vs 92.00%, $p< 0.05$) in comparison to higher-income households (those earning about $54 817). Similarly, Adamu *et al*., (2012) notes that, low income families tend to have either little to eat or purchase less nutritious and cheap foods which is less likely to meet the nutritional requirement of the household particularly that of children and adolescents. Other factors such as food security (Kaiser *et al*., 2003; Potamites and Gordon, 2010) and nutritional knowledge of caregivers can also influence household dietary intake.

In the household, young children's dietary needs should be of most importance since the first five years are the most critical period. This is as a result of their increased nutrient and energy requirements thus making them nutritionally vulnerable. The increased nutrient and energy needs according to UNICEF-WHO-World Bank (2012) is to ensure rapid growth, proper organ formation, strong immune system, neurological and cognitive development. Foods eaten during this period must therefore be nutritious to satisfy the rapid growth and should ideally be rich in essential vitamins as well as minerals (iron, zinc, iodine etc.) in order to support proper growth and enhance immunity against diseases (Tanzanian Nutrition and Food Centre, 2006). If foods consumed at this stage do not adequately meet these nutrient needs, the first five years may be prone to an increased risk of malnutrition. Malnutrition-related problems of children have been reported to include underweight and micronutrient deficiencies of iron, zinc, iodine and vitamin A (Best *et al*., 2010), stunting and wasting (Black *et al*., 2013). The Ghana Statistical Service, GSS and Ghana Health Service, GHS (2009) reported that 14% and 28% of pre-school children (< 5years) were underweight and stunted respectively with the Eastern Region alone recording a prevalence of stunting, underweight and wasting of children (< 5years) being 37.9%, 3.5% and 12% respectively (GSS, 2009).

San Huan (2006) suggests that gradual transitioning into family foods usually begins from age (1-2 years) onwards and as they reach age three onwards, there is complete transition. The period during which children are completely weaned might be a problematic stage mostly because they are now solely dependent on household foods which may or may not have enough diversification or be nutritionally adequate. There might also be the issue of less attention being paid to their dietary needs as compared to when they were on complementary feeding.

It is important in ensuring the adequacy and quality of such children's diet since inadequate and poor dietary intake could lead to increased risk of malnutrition with many of them entering into school age with some nutritional deficits.

1.2 Rationale

Emphasis has been placed on exclusive breast feeding, appropriate complementary feeding practices and dietary intake and nutritional status of school age children. But the period between weaning and school age has received little attention with little documentation on dietary intake and nutritional status of preschool children 3 years and above after they have fully transitioned into household foods.

This study intended to bridge this knowledge gap and to assess how foods consumed in the household related to children's (3-6 years) dietary intake in the Asesewa sub-district as well as to assess whether household food intake was a proxy for child's dietary intake.

1.3 Main objective

The main objective of this study was to determine the relationship between household food consumption and dietary intake of children 3-6 years in Asesewa sub-district

1.4 Specific objectives

1. To determine household food consumption of households in Asesewa sub-district
2. To assess dietary intake of children 3-6 years in Asesewa sub-district
3. To determine the strength of association between household dietary diversity and dietary diversity of children 3-6 years
4. To assess the relationship between household dietary diversity and nutritional status of children 3-6 years

5a. To assess the relationship between nutritional knowledge of caregivers and children's dietary diversity

5b. To determine the relationship between nutritional knowledge of caregivers and children's nutritional status.

1.5 Hypothesis

Based on specific objective 3, the hypothesis for this study was that, children living in households with high dietary diversity will consume highly diverse diet.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Household food consumption

Food is the basic necessity of life, and every individual needs a minimum amount of it for existence and a balance diet for proper growth and development (Begum *et al*., 2010). When there are availability issues, there is deprivation of a balanced diet which may lead to malnutrition and various health related problems, affecting the economic growth and wellbeing of members of households and ultimately that of the country (Begum *et al*., 2010). Foods consumed in household goes a long way to affect the dietary intake and nutritional status of household members especially children since the household may determine what is eaten, where it should be eaten, how much, and when it should be eaten.

Household food consumption is understood to encompass self-production, non-market gifts and exchanges, and expenditures (Giraud, 2015). A report that used information from 36 national and urban household consumption and expenditure surveys (NHCS) in countries in West Africa (between 2001 and 2011) found starchy staples to be the highest bought and consumed foods in most households (Giraud, 2015). The second consisted of animal products with 'other' products such as sauce related products (vegetables, oils, pulses, and nuts) as well as products that are bought out of home but consumed at home being the least consumed. Similarly, foods consumed in Ghanaian households largely comprise of starchy staples such as maize, cassava, plantain, yam, rice, millet and sorghum (FAO, 2009). These are accompanied with thick, well-seasoned sauces or soups and mainly eaten at lunch and dinner (FAO, 2009). The Ghanaian diet however varies according to regions and between the urban

and rural sector. In the North, millet, sorghum and yam are the main staples, while in the South and West, cassava, maize, plantain and cocoyam are common. In the dry south-eastern region the most common staples are maize and cassava (FAO, 2009). Rice is a staple throughout many households in the country, especially in urban areas; a long-shelf life and relative ease of preparation of rice explains the current increase in consumption in most households. With rapid urbanization, the demand for imported foods has increased, especially for wheat and rice, causing a shift in consumption patterns of the urban population. The consumption of poultry meat, wheat and ready-made meals is much higher in urban areas than in rural areas. Rural inhabitants consume more starchy roots, pulses and nuts than their counterparts in urban areas. In terms of micronutrient intake, the rural diet is poorer than the urban (FAO, 2009). Household food consumption is usually measured by classifying them into different food groups. FAO, (2011) proposes a twelve (12) food group classification that separates main staples into two groups, disaggregates meat, fish, and eggs, and also includes a group for miscellaneous food items. In Ghana, other studies however have measured foods consumed in the households under the six food groups of Ghana namely, starchy roots and plantain, grains and cereals, animal products, beans, nuts and oilseeds, fruits and vegetables, fats and oils (Nti, 2008; Nti *et al*., 2012).

2.1.1 Household dietary diversity

Dietary diversification is very important in ensuring that the recommended intake of nutrients are met by individuals in the household. Based on the food groups mentioned earlier, proxy measures for measuring household dietary diversity have been developed. These are household dietary diversity score (HDDS) and food consumption score (FCS) which have both been validated in different countries (Wiesmann *et al*., 2009; Rose, 2008). Household dietary diversity implies the number of individual food items or food groups consumed by members

of the household usually in the previous 24 hours or in the past week (FAO, 2011). At the household level, dietary diversity is not only indicative of diet quality but also reflects the economic ability of a household to access a variety of foods (FAO, 2011).The food consumption score uses information on both dietary diversity and food frequency (number of days the food is consumed per week) and applies a weighting system (WFP, 2007) and is also used in monitoring household economic access to food.

Arimond and Ruel, (2004) noted that a more diversified diet is reflective of dietary adequacy thus individuals consuming a more diverse diet are thought to be more likely to meet their nutrient needs. A meta-analysis from ten poor and middle income countries investigating the association between household dietary diversity and food security found that, one percent increase in dietary diversity was associated with a one percent increase in per capita consumption, a 0.7 percent increase in total per capita caloric availability, a 0.5 percent increase in household per capita daily caloric availability from staples, and a 1.4 percent increase from non-staples. (Hoddinott and Yohannes, 2002). Suggesting that an increase in household dietary diversity corresponds to increased caloric intake from foods which is needed to meet energy and nutrient needs.

Lack of diversity, usually found in the developing countries where diets include mostly starchy staples, with few or no animal products, and may be high in fats and sugars (Carletto *et al*., 2013) may relate to the problem of multiple nutrient deficiencies. For young children in the households, this may be problematic since they need energy and an array of essential nutrients from a diversified diet for rapid mental and physical development (Arimond and Ruel, 2004)

2.2 Factors influencing household food consumption

The diets of children in the household as well as their nutritional status are mediated by factors that influence household food consumption. Such factors include socio-economic and demographics of the caregiver, food security and nutritional knowledge.

2.2.1 Socio- demographic factors

2.2.1.1 Household income

Kostakis, (2014) who conducted an extensive survey of eight hundred (800) households to find determinants of household food expenditures found one of the most important determinants to be per capita monthly income of the household. Household income according to Al-Mekhlafi *et al*., (2008) affects access to food and the quality of diet eaten. Similarly, a cross-sectional survey of low income households in rural Malaysia also suggests that there exists an association between monthly income of households and access to food where a decrease in total income of households by 10RM was associated with 3% increase in odds of not having enough food to eat (aOR : 0.997, 95% CI: 0.995-0.998) (Ihab *et al*., 2013). A study that used secondary analysis of data conducted in Canadian households (n=10,924) (Ricciuto *et al*., 2006) to investigate the socio-demographic influences on some food groups found that after controlling for household size and educational level, higher income households (defined as log per-capita income) was associated with purchasing more from all food groups ($P< 0.0001$) where an increase in per capita income increased purchasing and consumption of food groups such as fruits and vegetables, grain products and meat products. Likewise, Kirkpatrick and Tarasuk, (2003) who explored food expenditure patterns between low and higher income households also revealed that households with low income ($1,317) appeared to purchase and consume significantly fewer servings of vegetables and fruits (85.97 % vs 92.12 %, $p< 0.05$) and milk products (87.72% vs 92.00%, $p< 0.05$) in comparison to

higher-income households (those earning $54 817). Adamu *et al*., (2012) notes that, low income families tend to have little to eat or either purchase less nutritious and cheap foods which is less likely to meet the nutritional requirement of the household particularly that of children and adolescents.

2.2.1.1.1 Influence of household income on nutritional status of children

There is an inverse relationship between household income and nutritional status of children (Al-Mekhlafi *et al*., 2008) in the household. For example a study that looked at the role of socio-economic characteristics on the nutritional status of 786 Nepalese children found that households with less than 300 Rupees were four times (OR: 4.43; 95% CI: 1.9-10.4) more likely to have stunted or wasted children than households that earned 500 Rupees or more (Joshi *et al*., 2011). A similar study among Kenyan children (n=384) that established the determinants of undernutrition (Chesire *et al*., 2008) discovered that households with lower monthly income (less Ksh.3000 (US$ 45) had a significant proportion of stunted children (X^2 = 7.361, p = 0.025) than those with higher incomes (more than Ksh. 5000 (US$ 74). Household monthly income is also very important as it affects health care and housing facility which agrees with reports by Ndukwu *et al*. (2013) that children living in poor quality homes such as rented rooms are more likely to be malnourished. A study conducted in 300 households in Western Kenya conversely did not show any effect of household income on the nutritional status of preschool children (Walingo, 2012).

2.2.1.2 Household size and composition

Jacobson *et al*., (2010) remarks that there exists a positive relationship between the number of members in a household and the level of its expenditures and consumption on food. In analyzing the effects of socio-demographics on foods purchased and consumed in Canadian

households (n = 10,924), Ricciuto *et al*., (2006), showed that more older adults than younger ones in the household purchased and consumed from more food groups especially from vegetables and fruits ($p<0.0001$). Another study by Ihab *et al*., (2013) revealed that larger households were more likely to have less food to eat than smaller households. The results further showed that an increase in household-size by one member was associated with 77.0% increase in the odds of that household being food-insecure (aOR.: 1.77, 95% CI: 1.35-2.32). Ojiako *et al*., (2009) also reported that an increased number of dependents in the household reduced the amount of both quantity and quality of food available for poor rural households and further showed an inverse relationship between nutritional status and household size.

2.2.1.2.1 Influence of household size and composition on nutritional status of children

Increased family size may influence the nutritional status of household members, particularly preschool children as it may be associated with decreased per capita human inputs (Chaudhury, 1984). Chaudhury, (1984) further explained that the allocation of food per child is likely to decrease with the increase in the number of children, which, in turn, may adversely affect the nutritional status of the children. In relation to nutritional status, Mekonnen *et al*., (2013) found among 790 primary school children from rural Ethiopia that children from a family size of 6-8 had an increased risk of being stunted than those from a family size of 2-5 members. However, Hien and Hoa (2009) found that in Vietman, large household sizes were a protective factor against undernutrition in children. This they explained was because extended families tended to care and provide proper diets for their children suggesting that there may be quality of family life in larger households.

Other socio-demographic factors apart from household income and size influencing household foods are reported to include education, where more educated caregivers are seen to have a more balanced diet by choosing a more diverse diet (Kostakis, 2014) and is

associated with higher consumption of vegetables and fruits, low fat milk and high fiber foods (Ricciuto *et al*., 2006). People who are employed or married are also seen to be associated with increased food expenditures and consumption in the household than those having no employment status or spouse (Kostakis, 2014).

2.2.2 Food security

Household food accessibility is essential as it also influences the dietary intake of individuals and children in the household which in turn affects their nutritional status. FAO (2012), reports that 870 million people worldwide do not have enough to eat in a day with as many as 66 million primary school children attending school on an empty stomach (WFP, 2009). A third (23 million) of these primary school children are coming from Africa (WFP, 2012). Kaiser *et al*., (2003) observed that studies examining food insecurity in US populations reported significant associations between deepening food insecurity and reduction in household foods with less frequent consumption of fruits and vegetables. A study that examined the relationship between food security and 274 low-income Latino households with preschool children (Kaiser *et al*., (2003) found that after controlling for maternal education, households with greater food insecurity was associated with lower variety of most foods especially fruits ($r = - 0.36$, $p<0.001$) and vegetables ($r = -0.29$, $p<0.001$). Potamites and Gordon, (2010) again indicated that food insecurity was associated with lower dietary intakes among household members and children which was attributed to the inability of the households to assess good nutritious food.

2.2.2.1 Influence of food security on nutritional status of children

In a review of studies on nutrition and school performance by Tarras (2005), it was reported that food insufficiency was enough to lead to changes in height and weight ratios

which was in accordance with (Ajao *et al*., 2011) who examined the effect of family size, household food security on nutritional status of preschoolers in Nigeria and found that, food insecure households were five times more likely than food secure households to have wasted children (OR=5.707, 95% CI=1.31-24.85). However, according to Nord and Hopman (2007), children are least affected when the household is food insecure. This they relate to the fact that food insecure households tend to shield the children from the effects of the situation and prioritize the children's nutritional wellbeing over adults. Osei *et al*., (2010) did not find any significant associations between household food insecurity and stunting, underweight and or anaemia when their study examined the relationship between household food insecurity and malnutrition among infants in Kailali District of Nepal.

2.3 Nutrient needs of children

The total population of children aged 0-4 years and 5-9 years in Ghana as of 2010 was 3,405,406 and 3,128,952 respectively (Ghana Statistical Service, 2013) suggesting that a sufficient number of the population are in the youthful age. Nutrition in the early years of children should be of most importance since the first five years are the most critical period. This is as a result of their increased nutrient and energy requirements thus making them nutritionally vulnerable. The increased nutrient and energy needs according to UNICEF-WHO-World Bank (2012) is to ensure rapid growth, proper organ formation, strong immune system, neurological and cognitive development. Foods eaten during this period must therefore be nutritious to satisfy the rapid growth and should ideally be rich in essential vitamins as well as minerals (iron, zinc, iodine etc.) in order to support proper growth and enhance immunity against diseases (Tanzanian Nutrition and Food Centre, 2006). FAO recommends that energy needed for optimum growth should compare with the daily energy requirement based on children's age and sex (FAO, 2004b). Frequency of meals should also

be three (3) meals with snacks per day (FAO, 2004a). If foods consumed at this stage do not adequately meet these nutrient needs, the first five years may be prone to an increased risk of malnutrition.

2.4 Dietary intake of children

2.4.1 Dietary diversity

Proper dietary intake in children cannot be over-emphasized as it is the foundation for healthy growth and development. While examining the nutritional status of 394 children in Kaduna, Nigeria, Hassan *et al*., (2012) found a linear relationship between nutrient adequacy of a child's diet and their nutritional status.

An essential aspect of dietary intake is dietary diversity which according to FAO (2011) reflects the nutrient quality of an individual's diet as well as nutrient adequacy as it is thought that individuals consuming a more diverse diet are more likely to meet their nutrient needs (Arimond and Ruel, 2004). Kennedy *et al*., (2007) noted that, intake of a variety of foods has been a recommendation for achieving adequate nutrient intake and the recommendation appears in the dietary guidelines of many countries. Some studies have shown that dietary diversity is positively associated with overall dietary quality and micronutrient intake of young children. This compares with studies that assessed whether dietary diversity scores were good indicators of micronutrient intake in 24-71 month old non-breast feeding Filipino children (Kennedy *et al*., 2007). Results indicated a positive significant correlation between the dietary diversity score and probability of adequate nutrient intake (MPA) ($r = 0.36$, $P < 0.001$). After maximizing sensitivity and specificity, the best cut-off

points for achieving 50 and 75% probability of adequate micronutrient intake was also found to be 5 and 6 food groups, respectively. Similarly, a secondary data analyses to assess the nutrient adequacy of South African children (1 - 8 years) also showed a high correlation between dietary diversity scores and Mean Adequacy Ratio ($r = 0.657$; $P < 0.001$) (Steyn *et al*., 2006) and a dietary diversity score of 4 was shown to be the best indicator of Mean Adequacy Ratio less than 50% since they provided the best sensitivity and specificity.

2.4.1.1 Dietary diversity and nutritional status

Dietary diversity can also have an influence in the nutritional status of children. Reports by Steyn *et al*., (2006) showed that children with dietary diversity score less than 6 (low dietary diversity) were most probable to have weight-for-age and weight-for-height Z-scores less than zero and were regarded as being at risk of undernutrition. A meta-analysis from 11 Demographic and Health Surveys (DHS) that examined the association between dietary diversity and height-for-age Z-scores of 2-23 month olds (Arimond and Ruel, 2003) found that while controlling for household wealth, dietary diversity was significantly associated with HAZ, either as a main effect or in an interaction in all but one of the countries analyzed. Hooshman and Udipi (2013) in their study of 4570 school children in India and Iran indicated that increasing dietary diversity scores were associated with higher BMI ($F=32.197$, $p=0.000$ for Indian children and $F=9.345$, $p=0.000$ for Iranian children). A positive relationship was also found between height-for-age z scores and diet diverse in food groups such as pulses and dairy food products. Also in Southwestern Nigerian school children, Olumakaiye (2013) showed that stunted and wasted children were significantly associated with lower dietary diversity scores ($p = 0.024$ and $p = 0.018$ respectively). The food groups at the lowest levels in the children's diet were organ meats, milk and milk products, eggs, and

vitamin A rich fruits and vegetables. These findings suggest that there is an association between child dietary diversity and nutritional status.

2.5 Factors affecting dietary intake of children

Several factors may influence the dietary intake of children in the household. Socio-demographic and the nutritional knowledge of caregivers are but a few factors that can affect child dietary intake.

2.5.1 Socio-demographic factors

A study by Eloranta *et al.*, (2011) to investigate associations between food consumption, nutrient intake and socioeconomic status found that children in households with high monthly income (≥60001 €) were twice as likely to consume skimmed milk (OR: 2.43, 95% CI: 1.21–4.88) and fish (OR: 2.21, 95% CI: 1.12–4.36) as recommended than children in households with low monthly income (3000-6000 €). It was also found that education played a key role in the children's diet as children of parents with higher education more likely ate fish (OR: 2.20, 95% CI: 1.06–4.54), fiber-rich bread (OR: 5.06, 95% CI: 1.80–14.29) and main meals (OR: 2.54, 95% CI: 1.34–4.83), but less likely used soft margarine (OR 0.43, 95% CI 0.20–0.94) as recommended than children who had parents with little or no education. Likewise, Per capita expenditure (mirror image of household income) of food was likewise found to be associated with the intake of 270 calories, 10 grams of protein, and a 16 per cent increase in the caloric adequacy ratio of preschool children in Bangladesh with significance at the 0.0001 level (Chaudhury 1984). Research that examined 154 Oman preschoolers and their parents (Al- Shookri *et al.*, 2011) found that mothers with higher educational levels had significantly ($p< 0.05$) more children (81.8% vs 29.3%) meeting the recommendation for fruits (1-2 pieces a day), meat, fish, chicken and eggs (96.4% vs 57.1%) , milk products (57.1% vs

36.2%) and vegetables (85.7% vs 36.4%). These results were in accordance with a study investigating whether differences in mothers' food parenting practices by educational level could explain differences in food consumption in Flemish preschool children (Vereecken, 2004); mothers with high educational levels were found to be associated with higher consumption of fruits ($p<0.002$) and vegetables ($p<0.009$) than mothers with lower educational levels. Studies in Ghana did not differ much as results by (Armar-Klemesu *et al*., 2000) indicated that while keeping income and other child, maternal and household characteristics constant, maternal education was strongly and positively associated with better child feeding ($P< 0.10$) and hygiene practices which may in turn have positive effects on children's nutritional status. According to Chaudhury (1984),

> *'The relationship between parental education and dietary intake of pre-school children is a complicated one. On one hand, more education is associated with greater awareness of children's needs and better child-care practices. Better educated parents should be able to provide their children with a more nutritious diet at any income level because of their increased knowledge. On the other hand, higher education may promote values detrimental to child health and nutrition. For example, it may lead women to work outside the home with a resulting drop in time spent on child care'.*

In relation to how household size influences the dietary intake of children, Al-Shookri *et al*., 2011 indicated that households with larger family size (extended family) were associated with children's intake of vegetables, fruits, and meat products compared to a small family size (nuclear family). Thus having more members in the family means having more family members to care and provide proper meals for the children. Kucera, (1991) hypothesized that small families with children were at lower nutritional risk than children from medium or large families after controlling for age, sex, ethnicity, family income and maternal education. Ajao

et al., (2011) did not find any significant association between family size or number of Nigerian preschoolers and poor nutrition status. It should be emphasized that it is not family size but the number of adults relative to children in a household that plays a pivotal role in affecting the nutrient intake of children. Thus, the lower the dependency ratio, the higher the nutrient intake of pre-school children (Chaudhury 1984). Other socio- demographic factors may include age, birth spacing, sex of the child (Chaudhury 1984) and occupation of caregivers (Al-Shookri *et al*., 2011)

2.5.2 Nutritional knowledge of caregiver

The nutritional knowledge of caregivers play a pivotal role in making either healthy or unhealthy food choices which translates to the quality of foods eaten at the household and especially by the children. This is important since caregivers are primarily responsible for what is eaten both at the household and individual level. Yabancı *et al*., (2014) who researched into mother's nutritional knowledge on nutritional attitudes and behaviors of Turkish children indicated that mothers with higher nutritional knowledge level had higher percentiles about preparing at least 3 portion vegetables, 2 portion fruit, and salads in each meal for their children and had normal body weight than those with low nutritional knowledge level ($p<0.05$). Similar results (Variyam *et al*., 1999) also indicted that nutrition knowledge has positive effects on the diets of preschool children; a higher level of maternal knowledge was associated significantly ($p= 0.01$) with lower intakes of total fat, saturated fat, cholesterol, and higher intake of fiber by two- to five-year-olds. Inadequate nutritional knowledge however could account for inadequate dietary intake and poor nutrition in children. This agrees with a Nepalese study of school aged children (Joshi *et al*., 2011) which found that 58% of mothers (n=205) with inadequate knowledge of dietary requirements of their children and nutritional value of foods had stunted or wasted children compared to those with adequate nutritional knowledge ($\chi 2$

=6.84; p<0.005). These caregivers they noted were more likely (OR: 1.53, 95%CI: 1.1-2.14) to have children who were malnourished (wasted or stunted) compared to those who had adequate dietary knowledge (Joshi *et al*., 2011). Studies in the Volta region of Ghana (Appoh and Krekling, 2005) showed that while investigating the relationship between mother's nutritional knowledge, maternal education, and child nutritional status (weight-for-age), nutritional knowledge scores were found to be significantly and independently associated (P< 0.001) with weight for age of the child after effects of other variables were controlled for. This goes to show that the nutritional knowledge of caregivers play an essential role not only in the quality of food choices but also the nutritional status of children.

2.6 Malnutrition in Children

Adequate nutrition is a basic right of every growing child but when this remains unmet malnutrition related issues arise. Globally, about 161 million and 51 million children under-five in 2013 were estimated to be stunted and wasted respectively (UNICEF *et al*., 2014b) with one third of the stunted and wasted children in Africa (UNICEF *et al*., 2014b). In Nigeria, research examining the nutritional status of 394 primary school children reported that about one half of the children were underweight with 43% of them being stunted (Hassan *et al*., 2012). Estimates in Ghana cannot be left out as the Ghana Statistical Service, GSS and Ghana Health Service, GHS (2009) also reported that 14% and 28% of pre-school children (< 5years) were underweight and stunted respectively with the Eastern Region alone recording a prevalence of stunting, underweight and wasting of children (< 5years) being 37.9%, 3.5% and 12% respectively (GSS, 2009). These estimates suggest that malnutrition in children is still a problem that needs to be addressed.

Malnutrition can have both short and long term adverse effect on the wellbeing of the children. Black *et al*., (2013) stated that malnutrition in children resulted in fetal growth

restriction, stunting, wasting, and vitamin A and zinc deficiency. He further estimated that the result of malnutrition was the cause of 3.1 million child deaths annually or 45% of all child deaths in 2011. According to Srivastava *et al*., (2012), childhood undernutrition explains the high mortality rates observed in developing countries and chronic undernutrition in childhood years could be connected with lower cognitive development with associated health implications later in life. In a study exploring the influence of serum ferritin and haemoglobin levels on the cognitive function of 427 school children in Thailand, it was realized that children with iron deficiency anemia had poorer cognitive functions but such function was improved when haemoglobin levels of the children was increased (Sungthong *et al*., 2002). In a nutshell, a compromised nutritional status could lead to increased susceptibility to infections, feeling of tiredness, poor physical growth, reduced work and mental performance, retardation of psychomotor development and reduced learning capacity in children (Adamu *et al*., 2012).

CHAPTER 3

3.0 METHODOLOGY

3.1 Study design

This study involved a cross sectional survey involving a one point time data collection.

3.2 Study Site

The study was conducted in the Asesewa sub-district which is one of the six sub-districts of the Upper Manya Krobo district found in the Eastern region of Ghana. The sub-district has an estimated population of 20,291 (Upper Manya Krobo District Health Directorate, 2012) with about forty-eight (48) communities. The inhabitants are predominantly Ga-Adangbe (Krobo) with many of them being farmers or traders. Communities included in the study were randomly selected from a list of the all control communities of the Nutrition-Links project currently underway in the Asesewa sub-district. These included; Odometa, Aboasa, Dzomoa, Akohia Yiti, Akohia Ovuganya, Battorkope and Teyi. These control communities were selected as they were not under any intervention programmes so the usual dietary intake of people in such communities may not be affected.

3.3 Study Population

Study participants included caregivers with children aged 3-6 years living in the Asesewa sub-district. The inclusion criteria for participation were: (a) caregivers with children in the target age group residing in any of the seven (7) selected control communities of Nutrition Links project in Asesewa sub-district (b) agreement to participate in the study by signing or thumb printing an informed consent form. Caregivers with children with conditions that could affect dietary intake such as cleft palate were however excluded from the study.

3.4 Sample Size Calculation

The sample size for this study was calculated using information from a previous study that compared dietary intake of children (2-5years) who attend Day Care Centers (DCC) to children who do not attend any DCC or school in rural Ghana (Harding *et al*., 2012). The dietary iron intake (which plays an important role in the cognitive development of children within the target age group) of DDC children was found to be 12.4 ± 6.4. Using the S.D in calculating for the sample size, the formula $n = \left(\frac{Z\,\sigma}{E}\right)^2$ was employed. Thus using a critical value (Z) of 1.96, S.D (σ) of 6.4 based on the study and a 10% margin of error (E), a sample size of 157 was obtained. This was rounded off to 165 caregiver-child pairs to cater for any incomplete data.

3.5 Sample recruitment

Recruitment was done through house to house visits and a total of 298 caregivers with children were visited in their households and the study explained to them. Out of that, 187 of them were found to have eligible children but 165 of them gave permission to participate in the study. In all, 165 caregiver-child pairs were enrolled into the study and this consisted of 27 respondents from Odometa, 33 from Aboasa, 20 from Dzomoa, 17 from Akohia Yiti, 21 from Akohia Ovuganya, 32 from Battorkope and 15 from Teyi. In each community, all the children who met the inclusion criteria and were present during the visit by the researcher were invited to participate. Interviews during the mornings were difficult to conduct as most caregivers were busy preparing their wards for school, were leaving for their farms or market or were not available to be interviewed. Interviews were therefore conducted in the afternoons.

3.6 Data Collection

Data collection took place from 17th November, 2014 till 20th February, 2015 and included questionnaire administration, dietary intake assessment and anthropometric measurements on both caregivers and their children. Data was collected with the help of two field assistants.

3.6.1 Training of field assistants

Two field assistants fluent in English, Krobo and Twi were recruited from Asesewa community and trained in the administration of informed consent and questionnaire as well as standard procedures for anthropometric measurements. Training sessions took place at the University of Ghana Nutrition Research and Training Centre in Asesewa and lasted for 4 days. Questionnaires were translated and taught in Twi and then in Krobo the local dialect with the help of a translator. Pre-testing of questionnaires then followed in Asesewa community F and was done through house to house visits.

3.6.2 Questionnaire administration

A structured questionnaire was used to solicit information from caregivers on socio-demographic and household characteristics, child morbidity and nutritional knowledge and dietary data during face-to-face interviews in their homes. The different components of the questionnaire are detailed below.

3.6.2.1 Socio-demographic and household data

Information of caregivers' socio-demographic characteristics (age, marital status, ethnicity, religion, education level, occupation, and income), household characteristics (income spent on food, household size, type of house, and source of drinking water),

possession of household assets (radio, TV, telephone, bicycle and private vehicle) and possession of domestic animals (poultry, goat, sheep, cattle, pigs) were sought for.

3.6.2.2 Child Morbidity

Structured questionnaire was used to collect information on whether the children had been sick of fever, diarrhoea, fast breathing/shortness of breath and cough and health seeking behavior of the caregivers during these illness.

3.6.2.3 Nutritional knowledge of caregiver

Information from caregivers was obtained on their knowledge of foods as sources of some nutrients, their ability to apply information in food choices and the knowledge of some diet-related diseases.

3.6.2.4 Dietary Assessment

The single 24-hour recall method and a 7-day food frequency questionnaire was used to interview the caregivers about their children's dietary intake in the past 24-hours and 7-days, respectively. Additionally a 7-day food frequency questionnaire was used to obtain information on dietary intake of all members of the household in the last 7-days. The food frequency questionnaire was adapted from the International Lipid-Based Nutrient Supplements (iLiNS) project (a research collaboration that is committed to accelerate progress in preventing malnutrition) which had previously been validated. The 24-hour recall required the caregivers to recall and estimate the quantities of all foods and beverages except water that their children consumed 24 hours prior to the interview, the time of day consumed and whether it was consumed in or outside the home. Food models and standard household measures were used to help estimate the quantities of each foods consumed. The child and household 7-day

food frequency questionnaires (FFQ) comprised of a list of commonly consumed foods categorized under 9 and 12 food groups, respectively, according to guidelines by the Food and Agriculture Organization of the United Nations (FAO, 2011). Using the food frequency questionnaires, caregivers were asked to indicate the number of days in the past seven days the child or household members had consumed the different food items on the food list.

3.7 Anthropometric measurements

3.7.1 Child and caregiver anthropometry

Both child and caregiver measurements were taken using standard procedures (CDC, 2011). Weight (to the nearest 0.1 kg) was taken with a Tanita BWB 800 weighing scale and height measurement (to the nearest 0.1 cm) taken using a wooden stadiometer. Measurements were taken in duplicate and the mean used in the analyses.

3.8 Ethical Considerations

Ethical approval for the study was obtained from and the Institutional Review Board (IRB) of Noguchi Memorial Institute for Medical Research, University of Ghana, Legon and was given the protocol number #013/14-15. Study participants were recruited into the study after the study has been explained to them and they had agreed to participate by signing or thumb printing an informed consent form.

3.9 Quality Control

Pretesting of questionnaires was done to ensure clarity of questions and to allow for appropriate corrections to be made. Two field assistants were trained on how to administer questionnaires and take anthropometric measurements. All completed questionnaires were reviewed on the field to check for errors, inconsistencies and to ensure accuracy by the student

investigator. Calibration of instruments was also appropriately done before measurements are taken.

3.10 Data Management and Analysis

Data for the study were entered, cleaned and analyzed using SPSS version 16.0. The FFQs were used to assess the food groups consumed in the households and by the child. A dietary diversity score for both household and child was then created from the food groups using the FAO guideline (FAO, 2011). The dietary diversity score was used as a proxy measure in order to investigate the adequacy and quality of diet of the study children. This is of importance since these children have been weaned and so depend solely on household foods. This period may be a problematic stage as less attention might be paid to their dietary and nutrient needs as compared to when they were receiving complementary foods.

Twelve food groups were considered for the household and nine food groups for the child, so a score of one was assigned to any food item in the food group consumed. Based on the distribution of scores obtained, household dietary diversity was categorised as low if households consumed 9 or less food groups in the past 7 days and categorized as high if households consumed 10 or more food groups. Children were categorized as having a low dietary diversity if they consumed 6 or less food groups in the past 7 days and had a high dietary diversity if 7 or more food groups were consumed. Child's dietary data obtained from the 24-hour recall were converted to energy and nutrient intakes using the Ghana food composition tables and RIING nutrient database and this was compared with Estimated Average Requirements (EAR) (Institute of Medicine, 2006; Scientific Advisory Committee on Nutrition (SACN) 2011). The proportion of children meeting their EAR for energy, protein, carbohydrate, vitamin A and C, calcium and iron were calculated.

Nutritional knowledge of caregivers was assessed using a scoring system on a scale of 0 to 12 based on responses to 12 nutrition-related questions. A score of one was given to any correct answer and zero for an incorrect one. Based on the distribution of scores obtained, caregivers who scored six to ten points were categorized as having a high nutritional knowledge and those with a score of 5 or less were classified as having a low nutritional knowledge (analysis showed that caregivers obtained a maximum score of 10 out of total of 12 questions).

Anthropometric data of weight and height for the child were converted to height-for-age Z scores (HAZ) and BMI-for-age Z scores (BAZ) using WHO Anthro Plus version 10.4 to assess for nutritional status. For the caregiver, Body Mass Index (BMI) less than 18.5 kg/m^2 (underweight), greater or equal to 18.5-24.99 kg/m^2 (normal) or greater or equal to 25.0 kg/m^2 (overweight) was used to assess nutritional status.

Descriptive statistics were used to summarise continuous and categorical variables. Continuous variables included age of index child, age of caregiver, household size, household income, mean energy and nutrient intakes summarised as means plus/minus standard deviations. Some categorical variables included, sex, ethnicity, level of education, relationship to index child, marital status, food groups consumed, dietary diversity, nutritional knowledge and nutritional status, all summarised as frequencies and proportions.

The relationships/associations between dependent variables (child dietary diversity, height for age and BMI for age) and their main independent variables were examined using Chi-square test and logistic regression was then employed to assess the strength of association after accounting for certain factors of interest. Factors accounted for in the logistic regression models were derived from bivariate analysis and from literature. Due to the low prevalence of underweight and overweight found in the study (BMI-for-age), no further analysis (logistic

regression) was conducted to determine the strength of association between BMI-for-age and the independent variables (household dietary diversity and caregiver's nutritional knowledge). Correlation test was further run to determine if household dietary diversity was a proxy for child's dietary diversity. Statistical significance was set at $p < 0.05$ for all the analyses.

CHAPTER 4

4.0 RESULTS

4.1 Background characteristics of study participants

A total of 165 caregiver-child pairs participated in this study within the period of November, 2014 and February, 2015. Background characteristics of caregivers and children in the study are summarized in Table 4.1. The mean age of study children was 4.3 ± 1.0 years with more than half (50.9%) being males.

The mean age of the caregivers was 33.3 ± 10.0 years and about 78% of them were the child's biological mother. The majority (73.3%) of the caregivers were of Krobo ethnicity. About (56%) and (18%) of them had completed Primary school and Junior High school, respectively. All of the caregivers were involved one economic activity or the other, the main one being farming (60%) and the majority were married or co-habiting.

About one-half (52.7%) of the caregivers reported a household income of at least 100 Ghana Cedis or more and the household weekly food expenditure was 42.5 ± 25.6 Ghana Cedis. About two-thirds of the caregivers lived in households headed by their husbands and 73.9% of their husbands were farmers. On average, households consisted of 7.0 ± 2.7 members with 3.6 ± 1.8 children.

Table 4.1: Background characteristics of study participants

Characteristics	Total (N=165)
Child characteristics	
Age (years)	[1]4.3 ± 1.0
Sex (% male)	[2]84 (50.9)
Caregiver characteristics	
Age (years)	33.3 ± 10.0
Relationship to child	
Mother	128 (77.6)
Father	10 (6.1)
Other relative[3]	27 (16.4)
Ethnicity	
Akan	9 (5.5)
Ewe	32 (19.4)
Krobo	121 (73.3)
Northerner	3 (1.8)
Level of education	
None	43 (26.1)
Primary	92 (55.8)
JHS	30 (18.2)
Occupation	
Trader	51 (30.9)
Farmer	99 (60)
Vocational	15 (9.1)
Marital Status	
Married/cohabitating	149 (90.3)
Unmarried[4]	16 (9.7)
Head of household	
Husband	110 (66.7)
Caregiver	24 (14.5)
Other relative[5]	31 (18.8)
Spouse occupation	
Trader	11 (6.7)
Teacher	5 (3.0)
Farmer	122 (73.9)
Vocational[6]	27 (16.3)
Household weekly food expenditure	42.5 ± 25.6
Household size	7.0 ± 2.7
Adults (≥18 years)	3.2 ± 1.6
Children (<18 years)	3.6 ± 1.8
Household monthly income	
<GH100	78 (47.3)
≥GH100	87 (52.7)

[1]Continuous variables presented as Mean ± SD and [2]number (percentages) for categorical variables;
[3]Other relative includes older sibling, grandparent, aunty/uncle; [4]Unmarried – single, divorced/separated, widowed;
[5]other relative includes grandparent, aunt/uncle; [6]Vocational - caterer, baker, seamstress and hairdresser;

4.2: Household food consumption and dietary diversity

Figure 4.1 shows food groups consumed by the households in the past seven (7) days. All households consumed foods made from cereals (maize, millet, rice, wheat) and vegetables including vitamin A rich vegetables and tubers, dark green leafy vegetables (mostly kontomire, ayoyo leaves) and other vegetables examples being (carrot, sweet potato, tomatoes, onion, pepper, okro, garden eggs). At least 90% of all households consumed foods made from roots and tubers, fish and sea food, oil and fats (mostly palm kernel oil and palm oil), sweets (soda, sweetened juice drinks, biscuit, chocolate), fruits and legumes nuts and seeds. More than one-half (58.8%) of the households consumed eggs but meat (including organ meat) and dairy products being were less consumed food groups.

The mean dietary diversity for the household was 9.88 ± 1.7 food groups out of 12 food groups. Approximately 66% of the households were classified as having a high dietary diversity based on consuming foods from at least 10 food groups in the past seven (7) days (Table 4.2).

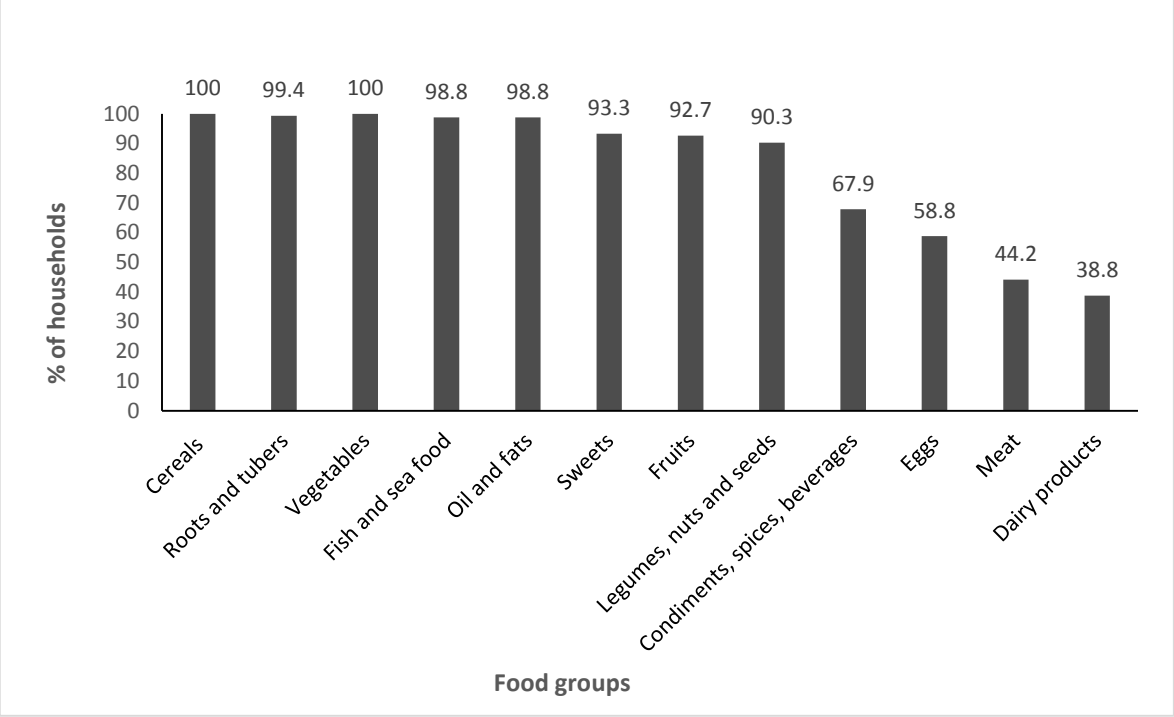

Figure 4.1 Proportion of households that consumed foods from different food groups in the past seven days.

Table 4.2: Household dietary diversity based on food groups consumed in the past seven days

Variable	Total (N=165)
Mean household dietary diversity	9.88 ± 1.7
Household dietary diversity	
High (≥10 food groups)	108 (65.5)
Low (≤ 9 food groups)	57 (34.5)

Continuous variables presented as Mean ± SD and number (percentages) for categorical variables

4.3: Dietary Intake of Children

4.3.1: Food groups consumed and dietary diversity

Figure 4.2 shows the food groups consumed by the study children in the past seven (7) days. Starchy staples and flesh meat and fish were the most commonly consumed food groups

with all the children having consumed them at least once in the last seven days. Other commonly consumed food groups were other fruits and vegetables (99.4%), legumes, nuts and seeds (90.9%), vitamin A rich fruits and vegetables (84.2%), dark green leafy vegetables (78.2%) (mainly kontomire and ayoyo leaves) and eggs (63%). Less than one-half (40.6%) of the children consumed dairy products and organ meat was the least consumed food group (18.2%).

The mean dietary diversity of the children was 6.75 ± 1.3 food groups (Table 4.3). Nearly 60% of the children were classified as having high dietary diversity based on consuming at least 7 food groups out of the total 9 food groups in the past seven (7) days.

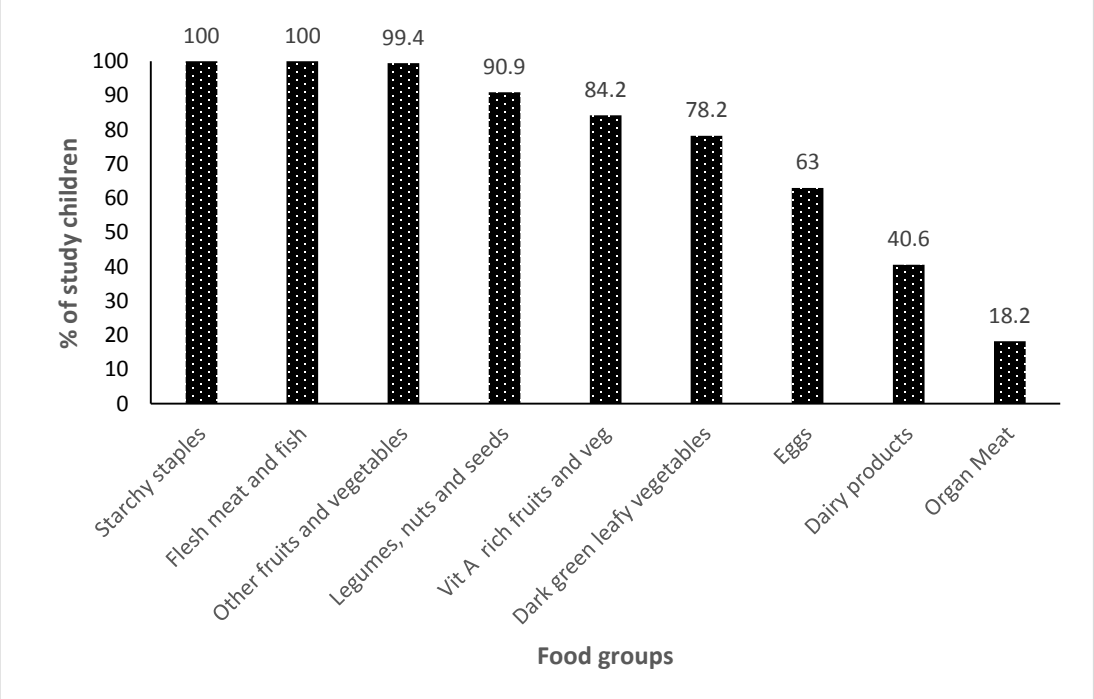

Figure 4.2: Proportion of children that consumed foods from different food groups in the past seven days

Table 4.3: Child dietary diversity based on food groups consumed in the past seven days

Variable	Total (N=165)	
Mean child dietary diversity	6.75 ± 1.3	
Child dietary diversity		
High (≥7 food groups)	96	(58.18)
Low (≤6 food groups)	69	(41.8)

Continuous variables presented as Mean ± SD and number (percentages) for categorical variables

4.3.3: Energy and nutrient intake of the children

Energy and nutrient intakes of the children were based on a single 24 - hour dietary recall and intakes were compared to Estimated Average Requirements (EAR) to determine the proportion of children meeting the EAR requirements. All the children met the EAR for carbohydrates and approximately 89% and 93% also met or exceeded their EAR for energy and protein, respectively. However, only a little over 50% of the children met the EAR for Vitamin A and Iron. Less than 30% of the children met the EAR for vitamin C with just 3.6% of them meeting their requirement for calcium.

Table 4.4: Energy and nutrient content of foods consumed by of study children in the past 24-hours (n=165)

Nutrient	Means ± SD	EAR		N (%) meeting EAR	
		3 yrs (n = 41)	4-6 yrs (n = 124)		
Energy* (kcal)	2576.1 ± 948	1165	1545	146	(88.5)
Protein(g)	48.7 ± 32	12	12	154	(93.3)
Carbohydrates(g)	285.0 ± 99	100	100	165	(100.0)
Vitamin A(RE)	434.4 ± 497.2	210	275	85	(51.5)
Vitamin C(mg)	17.7 ± 2.6	13	22	45	(27.3)
Calcium(mg)	182.8 ± 189	500	800	6	(3.6)
Iron(mg)	4.6 ± 4.1	3	4.1	87	(52.7)

(Dietary Reference Intakes-The Essential Guide to Nutrient Requirement. Institute of Medicine of the National Academics, 2006; *Scientific Advisory Committee on Nutrition (SACN), 2011)

4.4: Nutritional status of children.

Figure 4.3 describes the nutritional status of the children as per WHO cut offs. Approximately, 23% of the children were stunted, with very few (4.2%) being underweight or overweight (3%). Cumulatively, almost 30% of the children in the study had at least one nutritional deficit (stunting, underweight or overweight).

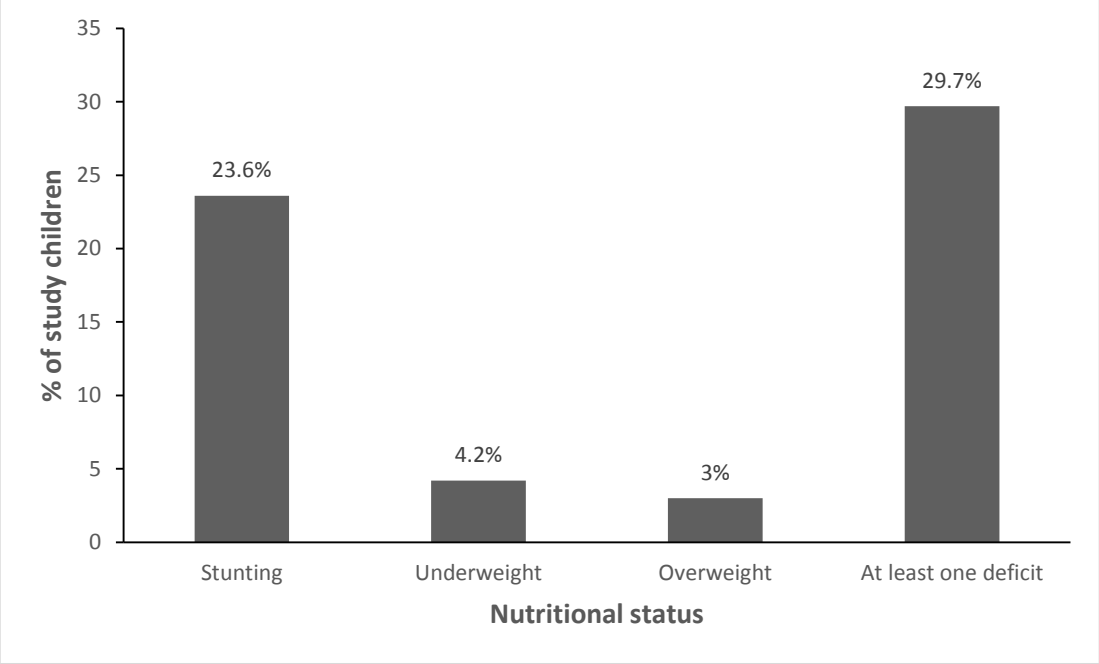

Figure 4.3: Prevalence of malnutrition among study children

4.5: Nutritional knowledge of caregivers

Less than half (48.1%) of the caregivers had a high level of nutritional knowledge i.e. responded correctly to 6 to 10 nutritional knowledge questions (analysis showed that caregivers obtained a maximum score of 10 out of total of 12 questions) (Figure 4.4). Table 4.5 also shows that about 58.9%, 48.5% and 42.4% of caregivers had fair knowledge of food sources rich in the three macro nutrients (carbohydrates, protein and fat respectively). Majority (98.8%) of them were able to identify that fruits and vegetables should be eaten frequently. However, with respect to diet related diseases, less than half of the caregivers were able to identify which dietary deficiency led to rickets, goiter, and scurvy.

Table 4.5: Nutritional knowledge of caregivers

Variable	Proportion of caregivers who answered correctly (n=154)
1.Cassava, yam and gari are rich sources of;	97 (58.8)
2.Chicken, eggs and fish are rich sources of;	80 (48.5)
3.Which of the following is a rich source of fat;	70 (42.4)
4.Milk and milk products are rich in;	22 (13.3)
5.Which of the following is a rich source of iron;	70 (42.4)
6.Which of the following is a rich source of dietary fiber/roughage;	49 (29.7)
7.Kwashiorkor is caused by inadequate intake of;	100 (60.6)
8.Rickets/ bow legs in children are caused by lack of;	23 (13.9)
9.Goiter is caused by lack of;	40 (24.4)
10.Bleeding of gums is caused by inadequate intake of;	56 (33.9)
11.When serving food at home, who do you think should get the greatest portion of fish;	114 (69.1)
12.Do you think fruits and vegetables must be eaten frequently;	163 (98.8)

Caregivers were given multiple answers to questions to pick from

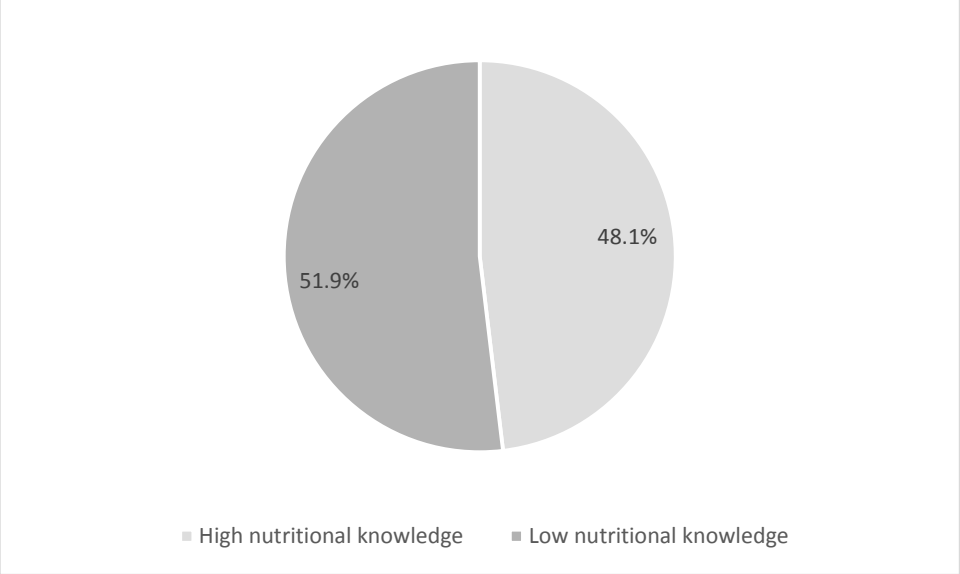

Figure 4. 4: Nutritional knowledge level of caregivers

Table 4.6: Variables included in the logistic regression analysis

Dependent variables	Independent variables	Code
1.Child dietary diversity (high = 0, low = 1)	Household dietary diversity[1]	High = 0, low = 1
	Household income[2]	< GH100 = 0, > GH100 = 1
	Sex of child[2]	Male = 0, female = 1
	Number of children in household[2]	≤3 = 0, >4 = 1
	Caregiver education[2]	[3]Others= 0, no formal education = 1
2. Height-for-age (normal = 0, stunted = 1)	Household dietary diversity[1]	High = 0, low = 1
	Nutritional knowledge[1]	High = 0, low = 1
	Household size[2]	≤5 = 0, >6 = 1
	Number of children in household[2]	≤3 =0, >4 = 1
	Sex of child[2]	Male = 0, female = 1
	Caregiver education[2]	[3]Others= 0, no formal education = 1
	Height of caregiver (continuous)	

[1]Main independent variables; [2]Other independent variables accounted for in the regression model; [3]Others include: Primary school, JHS/middle school

4.6: Relationship between household dietary diversity and children's dietary diversity

Table 4.7 shows the bivariate relationship between the main independent variables and dependent variables. Chi-square test was used in finding the relationships and binary logistic regression used to investigate the strength of association after accounting for certain factors (Table 4.8 to Table 4.11). There was a significant ($p < 0.001$) association between household dietary diversity and child's dietary diversity (Table 4.7). Correlation analysis used to evaluate the strength of association likewise showed a significant and positive correlation ($r = 0.653$, $p<0.001$) between household dietary diversity and child dietary diversity (Figure 4.5). Results also indicated that household dietary diversity score moderately predicted about 42.6% (R^2 =

0.4264) of the child's dietary diversity (Figure 4.5). Children belonging to households with high household dietary diversity had significantly higher dietary diversity compared to children belonging to households with low dietary diversity (72.2% vs 31.6%, p<0.001). After accounting for certain factors (household income, sex of child, number, of children in household, caregiver education) in the logistic regression model, it was found that children living in households with high dietary diversity had an almost six-fold likelihood of having a high dietary diversity compared to those in households with low dietary diversity (OR: 5.7; CI: 2.78 - 11.84) (Table 4.8).

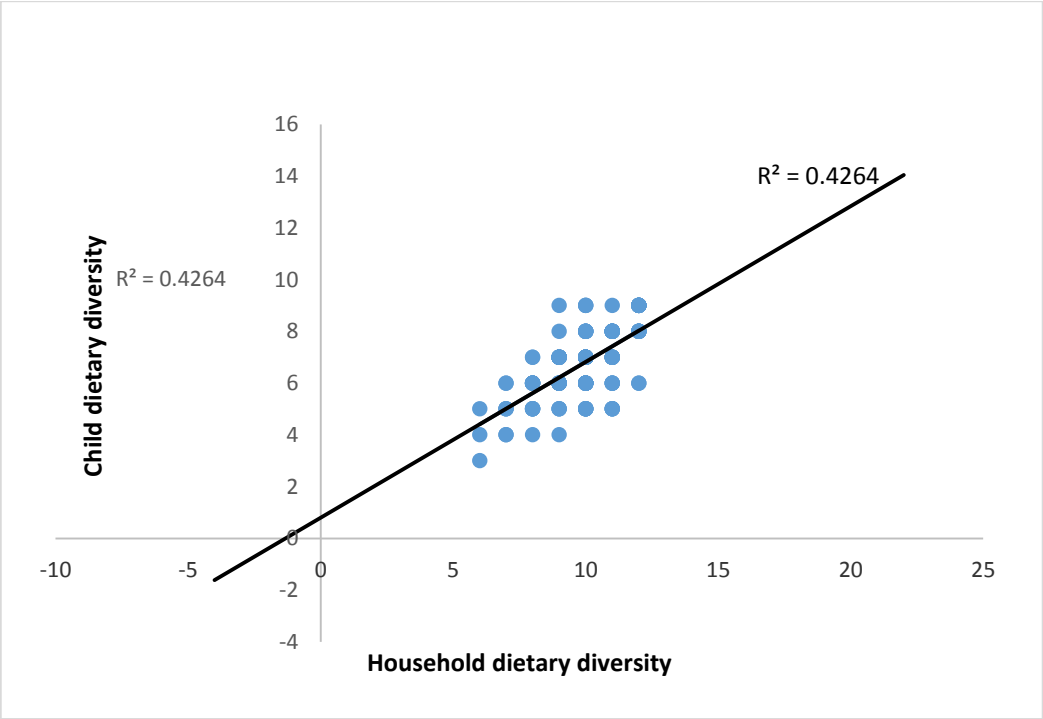

Figure 4.5: Correlation between household dietary diversity and child dietary diversity

Table 4.7: Bivariate analysis showing the relationships between: household dietary diversity and child's dietary diversity; household dietary diversity and nutritional status; nutritional knowledge and child's dietary diversity; nutritional knowledge and child's nutritional status

Dependent variables	Independent variables									
	Household dietary diversity					Nutritional knowledge				
	Low		High		P-value[1]	Low		High		P-value[1]
Child dietary diversity										
Low	39	(68.4)	30	(27.8)	**<0.001**	42	(48.8)	27	(34.2)	0.05
High	18	(31.6)	78	(72.2)		44	(51.2)	52	(65.8)	
Nutritional status										
HAZ										
Stunted	17	(29.8)	22	(20.4)	0.174	19	(22.1)	20	(25.3)	0.904
Normal	40	(70.2)	86	(79.6)		67	(77.9)	59	(74.7)	
BMI for age										
Underweight	2*	(3.5)	5	(4.6)	0.915	1 *	(1.2)	6	(7.6)	0.06
Normal	53	(93.0)	100	(92.6)		81	(94.2)	72	(91.1)	
Overweight	2 *	(3.5)	3 *	(1.9)		4 *	(4.7)	1*	(1.3)	

[1]**Chi square test. Cell counts were less than 5 cases and were unresolved.**

Table 4.8: Strength of association between household dietary diversity and child's dietary diversity

Independent Variable	Dependent variable: Child dietary diversity		
	OR	**95%CI**	**P-value**
Household dietary diversity			
High = 0	**5.7**	2.78 - 11.84	**<0.001**
Low = 1[3]			

Child dietary diversity (high=0, low=1[3]), [3]Reference category of categorical variables; Factors accounted for in this model include household income (<GH100=0, ≥GH100=1[3]); sex of child (male=0, female=1[3]); number of children in household (≤3=0, >4=1[3]), caregiver education (others=0, no formal education=1[3]) all of which were not significantly associated with dependent variable

4.7 Relationship between household dietary diversity and nutritional status of children.

Table 4.7 shows no significant association between household dietary diversity and height-for-age and BMI-for-age nor any significant association found between household dietary diversity and height-for age after accounting for certain factors of interest (Table 4.9). Due to the low prevalence of underweight and overweight found in the study (BMI-for-age), no further analysis (logistic regression) was conducted to determine the strength of association between BMI-for-age and household dietary diversity.

Table 4.9: Strength of association between household dietary diversity and nutritional status of children (HAZ)

Independent Variable	Dependent variable: Height-for-age (normal, stunted)		
	OR	**95%CI**	**P-value**
Household dietary diversity			
High = 0	0.6	0.29, 1.25	0.175
Low = 1[3]			

[3]Reference category of categorical variables; Stunted (HAZ<-2SD); Analysis based on binary logistic regression; Factors accounted for in the model include: caregiver education, height of caregiver, sex of child, household size, number of children in household

4.8: Relationship between nutritional knowledge of caregiver and child's dietary diversity

Table 4.7 shows a marginal significant association between caregiver's nutritional knowledge and child's dietary diversity. There was the tendency for caregivers with high nutritional knowledge to have a higher proportion of children (65.8% vs 51.2%, p=0.05) having a high dietary diversity compared to caregivers with low nutritional knowledge. There was also a tendency for caregivers with high nutritional knowledge to be more likely to have

children with high dietary diversity compared to caregivers with low nutritional knowledge (OR: 1.8; CI: 0.98, 3.44) (Table 4.10).

Table 4.10: Strength of association between caregiver's nutritional knowledge and child's dietary diversity

Independent variable	Dependent variable		
	Child dietary diversity		
	OR	95% CI	P-value
Caregiver nutritional knowledge			
High = 0	1.8	0.98 - 3.44	0.06
Low = 1[3]			

[3]**Reference category of categorical variables; Child dietary diversity (high=0, low=1[3]); other factors already accounted for in table 4.8**

4.9: Relationship between nutritional knowledge of caregiver and nutritional status of children

There was no significant association observed between caregiver's nutritional knowledge and height-for-age but a marginal significant association with BMI-for-age (p = 0.06) (Table 4.7). Table 4.11 also shows no significant association between nutritional knowledge of caregivers and height-for-age of children after accounting for certain factors of interest. No further analysis (logistic regression) was conducted to determine the strength of association between BMI-for-age and caregiver nutritional knowledge as a result of the low prevalence of underweight and overweight found in the study.

Table 4.11: Strength of association between nutritional knowledge of caregivers and nutritional status of children height-for-age.

Independent Variable	Dependent variable: Height-for-age (normal, stunted)		
	OR	**95% CI**	**P-value**
Caregiver nutritional knowledge			
High = 0	1.0	0.51- 2.14	0.904
Low = 1[3]			

[3]**Reference category of categorical variables; other factors already accounted for in table 4.9; Analysis based on binary logistic regression**

CHAPTER 5

5.0 DISCUSSION

5.1 Household dietary intake

The foods consumed by the households in this study were categorized into 12 food groups proposed by FAO (2011). McDonald *et al*., (2014) likewise used 12 food groups in assessing dietary intake of households. Other studies in Ghana have however looked at foods consumed in the households under the six food groups of Ghana namely, starchy roots and plantain, grains and cereals, animal products, beans, nuts and oilseeds, fruits and vegetables, fats and oils (Nti, 2008; Nti *et al*., 2012). From the study, a majority of the households reported that they consumed more from cereals, and roots and tubers in the past 7 days. They reported maize, rice and wheat as main examples of cereals consumed with yam, plantain, cassava and sweet potato as main examples of roots and tubers eaten. This is consistent with Upper Manya Krobo District Health Directorate, (2012) that briefly described the people of Upper Manya Krobo district (where Asesewa sub-district is located) as predominantly farmers and the major staples cultivated and eaten were maize, cassava, yam, plantain and sweet potato.

Less than half of the households however reported consuming flesh or organ meat with dairy products being the least consumed food group. This is not surprising since Carletto *et al*., (2013) has indicated that in developing countries, diets consumed mostly include starchy staples, with few or no animal products and may be high in fats and sugars. The low consumption of meat and dairy products could be attributed to the fact that these products are quite expensive and the low monthly income (less than 100 Cedis) reported by almost half of the households may have made it difficult in buying such foods for the household. It is worth noting that low income families are likely to have little to eat or either purchase less nutritious

and cheap foods which is less likely to meet the nutritional requirement of the household particularly that of children and adolescents Adamu *et al*., (2012).

The study showed that, the mean household dietary diversity was 9.88 ± 1.7, suggesting that on the average, households consumed about 10 food groups in the past 7 days. It was also found that about a greater proportion of households had a high dietary diversity. This is encouraging as it goes to show that there is diversification in the diets of more households in the Asesewa sub-district which is important in ensuring that recommended intake of energy and nutrients are met by individuals in the household. Hoddinott and Yohannes, (2002) whose results showed that one percent increase in dietary diversity was associated with a one percent increase in per capita consumption, a 0.7 percent increase in total per capita caloric availability, a 0.5 percent increase in household per capita daily caloric availability from staples, and a 1.4 percent increase from non-staples. Suggesting that an increase in household dietary diversity corresponds to increased caloric intake from foods which is needed to meet energy needs.

Even though dietary diversity was high in more households, their diets were higher in starchy staples (seen in the higher consumption from cereals and roots and tubers) which are mainly plant based and raises concern about bioavailability of iron. Plant based foods contain not only non-heme iron, but also have inhibitors such as polyphenols and phytates which could inhibit the absorption of non-heme iron from foods (Atuobi-Yeboah, 2010). Household dietary diversity is not only indicative of diet quality but also reflects the economic ability of a household to access a variety of foods (FAO, 2011) hence may be used as a good measure of household food access. Dietary diversity is positively linked to food security (Styen *et al*., 2006) which looks at access, availability and utilization of food. Thus a high dietary diversity

is indicative of food security and since the study showed more households having high dietary diversity, we could say that more households were food secure.

5.2 Children's dietary intake

5.2.1 Food groups consumed and dietary diversity

Diets consumed in the household may reflect the dietary intake of the children and as reported at the household level, starchy staples were also the most common food groups having all of the study children consuming from them. This is consistent with findings from (Carletto *et al*., 2013). The low consumption of dairy products by the study children is however worrisome since dairy products are the most nutrient dense source of calcium which is needed in preventing osteoporosis in young children (Ames *et al*., 1999). The low consumption of dairy products in the children could predispose them to an increased risk of nutritional rickets, an example is seen in a study in Nigeria which found that pre-school Nigerians with rickets also had low intake of calcium in their diets (Thacher *et al*., 1999). Organ meat (liver mainly eaten) was found to be the least consumed food group. Similarly, Olumakaiye. (2013) found among 600 Nigerian children that the least food groups consumed were organ meat and dairy products which compared to Revera *et al*. (2003) who identified that foods consumed by young children in some regions of Kenya and Mexico contained very few animal products. Organ meat is a good source of heme iron (FAO, 2011) which is easily made bioavailable to the body and Ntab *et al*. (2004) has reported that an increase in eggs and organ meat from a 24-hour recall of Senegalese children contributed immensely to key micronutrients like iron, zinc and phosphorous. These play important roles in the growth and development of young children. Since heme iron is vital in boasting haemoglobin levels and is recommended in food guides

(Rivera *et al*., 2003), caregivers need to be encouraged to make deliberate efforts to incorporate more organ meat such as liver and kidneys into the diets of their children.

An encouraging proportion of the study children consumed from green leafy vegetables such as kontomire and ayoyo leaves as well as vitamin A rich fruits and vegetables which are rich sources of vitamin A. Ntab *et al*., 2004 similarly reported high intakes of these food groups in his study children. Contrary to that, Olumakaiye, 2013 and Atuobi-Yeboah, (2010) recounted that food groups that were less consumed by their study children were vitamin A rich fruits and vegetables. This may be because their study children involved those aged between six months to twenty-three months who were on complementary feeding and thus were now gradually being introduced to a variety of foods particularly fruits and vegetables.

The study showed that the mean child dietary diversity score (DDS) was 6.75 ± 1.3 based on 9 food groups. Suggesting that on average the children consumed seven (7) food groups in the past 7 days. Other studies in two African countries, Kenya (Onyango *et al*., 1998) and Malawi (Ferguson *et al*., 1993) that have looked at dietary diversity of children using the same nine food groupings found the mean DDS to be 6 and 7.1 respectively which is close to the present study. Other studies have however looked at different food groupings, 10 food groups (Kennedy *et al*., 2007) and sixteen food groups (Olumakaiye, 2013) in calculating their dietary diversity. The study also found more than half of the children had high dietary diversity signifying that household meals contributed to more children meeting their nutrient adequacy. This agrees with (Arimond and Ruel, 2004) who stated that individuals consuming a more diverse diet are more likely to meet their nutrient needs and also reflects the nutrient quality of an individual's diet (FAO, 2011). While assessing whether dietary diversity scores (DDS) are good indicators of nutrient adequacy in preschoolers, Steyn *et al*., (2006) noted that

children with a dietary diversity score of less than 3 had a low nutrient adequacy and were more likely to be associated with height-for-age Z-score of a less than zero. Since on average the diets of the children consumed seven (7) food groups, we can say that the children in the present study are less likely to be stunted.

5.2.2 Energy and nutrient intakes of the children

The energy and nutrient intakes for this study was compared with Estimated Average Requirements which has been recommended as an improvement over using recommended nutrient intakes (RNI) for nutrient assessment of groups (Institute of Medicine, 2006). Data obtained revealed that diets provided by the households contributed to more children meeting or exceeding the EAR for energy and carbohydrates. The mean energy intake was 2576.1 ± 948 which was much higher compared to mean energy intakes found among other 2-5 year old rural Ghanaian children; Harding *et al*., (2012) and Ferguson *et al*., (1993) found the mean energy intake of their study children to be 1140 ± 320 and 1122 ± 240 respectively. The higher energy intakes seen in this present study could be likely due to the fact that all the study children consumed more from the starchy staples mainly maize, rice, cassava, yam and plantain which are energy dense foods. Onyango (2003) states adequate energy is needed to maintain basal metabolism and vital body functions and this energy can be obtained from a diet consisting of roots, tubers and cereals. A diverse diet (seen in the average number of food groups consumed by the children) has also been shown to be directly associated with greater energy intake (McCrory *et al*., 2000). Protein requirement was also met by a greater proportion of the children which could be explained by the high consumption of fish and flesh meat food group. Half of the children however met their EAR for vitamin A. The proportion of children meeting their requirement for vitamin A was quite surprising since more of them were reported to consume vitamin A rich fruits and vegetables and green leafy vegetables which are all good

sources of vitamin A. This could be as a result of over reporting of these food groups by the caregivers. Inadequate intake of vitamin A for long periods could lead to vitamin A deficiency which is a major public health problem affecting an estimated 190 million preschool age children (WHO, 2011), mostly from the World Health Organization (WHO) regions of Africa and South East Asia and may result in visual impairment (night blindness) or increase the risk of illness and mortality from childhood infections such as measles and those causing diarrhoea (WHO, 2011). Vitamin A supplementation should therefore be made more of a priority in the sub-district.

Cereals such as maize and rice which were commonly consumed by the children is made up of polyphenols and phytates which could inhibit the absorption of heme-iron, and could explain why almost half of the children did not meet the EAR for iron. Adequate intake of iron is important in preventing iron deficiency anaemia and other health related issues. Sungthong *et al*., (2002) likewise reported that in exploring the influence of serum ferritin and haemoglobin levels on the cognitive function of 427 children in Thailand, children with iron deficiency anemia had poorer cognitive functions but such function was improved when haemoglobin levels of the children was increased. It is sad to note that calcium requirement was only met by about 3.6% of the children. According to Henry and Chapman, (2002), calcium intakes of Africans can be much lower than 300-400mg/day and this was no different from the mean calcium intake reported in the study (182.8 ± 189). Harding *et al*., (2012) recounted daily calcium intakes with similar age groups (2-5years) in their study to be 244 ± 118 which is higher than found in the present study but still below the recommended intakes. The low proportion of children who did not meet the EAR for calcium is not surprising since the diet of children (as observed in the food groups consumed) showed that less than half of them were consuming from dairy products which is very dense in dietary calcium. Adequate

calcium intakes is needed in preventing osteoporosis in young children (Ames *et al*., 1999). It is also worth noting that ensuring the adequacy and quality of children who have been weaned and are dependent on household foods may lead to decreased risk of malnutrition and reduce the chances of many of them entering into school age with some nutritional deficits

5.3 Nutritional status of the children

Improper dietary intake could lead to issues of malnutrition. Globally, about 212 million children under-five are estimated to be malnourished (UNICEF *et al*., 2014b). The prevalence of stunting, underweight and overweight reported in the study was quite low. The stunting rate in this study was lower compared to national prevalence of 28% of preschoolers (GHS, 2009). This was also lower than found in reports in the Eastern region of Ghana where Asesewa sub-district is located (37.9%) (GSS, 2009). The prevalence of underweight recorded by the Ghana Statistical Service, GSS (2009) was much higher than reported in the present study (14% vs 4.2%) but compared to estimated reported in the Eastern region of Ghana (3.5%) (GSS, 2009). The estimates should be interpreted with caution since data for both the national level and Eastern region is dated in 2009, so may not represent the most current stunting and underweight rates of preschoolers in Ghana. About 3% of the study children were in the overweight category which was also lower than other reports (17.8%) (Gewa, 2009), (3.5%) (De Onis and Blössner, 2000) and (12.2%) (Martorell *et al*., 2000) that have looked at overweight among preschool children in developing countries. The lower prevalence of stunting, underweight and overweight reported is very encouraging and could likely be due to the fact that meals provided by the households were adequate for the children which is seen as more of the study children had a higher dietary diversity. This is evidenced in a study by Hooshman and Udipi (2013) whose results showed that increasing dietary diversity was associated with higher BMI ($F=32.197$, $p<0.001$) for Indian children and Iranian children

(F=9.345, p<0.001). Similarly, reports by Steyn *et al*., (2006) also showed that children with dietary diversity score less than 6 (low dietary diversity) were regarded as being at risk of undernutrition which compared with results by Olumakaiye (2013) that stunted and wasted children were significantly associated with lower dietary diversity scores (p = 0.024 and p = 0.018 respectively). The encouraging proportion of children who were also found to meet the EAR for energy and other nutrients could have contributed to the low rates observed.

Proper dietary intake in children (particularly those who have been weaned and are dependent on household foods) cannot be over-emphasized as this is the foundation for healthy growth and development. Adamu *et al*., (2012) equally states that a compromised nutritional status could lead to increased susceptibility to infections, feeling of tiredness, poor physical growth, reduced work and mental performance, retardation of psychomotor development and reduced learning capacity in children.

5. 4 Relationship between household dietary diversity and children's dietary diversity

Results from the study showed a significant association between household dietary diversity and children's dietary diversity. Children in the study who belonged to households with high dietary diversity were also found to have significantly higher dietary diversity compared to households with low dietary diversity. Indicative that households with high dietary diversity corresponds to children also having a high dietary diversity. Since more of the households in the study reported a higher income (≥GH100), it is likely that they were able to purchase and consume more foods which reflected in the diet of the children. This agrees with a study that used secondary analysis of data conducted in Canadian households (n=10,924) (Ricciuto *et al*., 2006) to investigate the socio-demographic influences on some food groups; Results showed that higher income households (defined as log per-capita income)

was associated with purchasing more from all food groups ($P < 0.0001$) where an increase in per capita income increased purchasing and consumption of food groups such as grain products, fruits and vegetables and grain products. Arimond and Ruel, (2004) noted that a more diversified diet is reflective of dietary adequacy thus individuals consuming a more diverse diet are thought to more likely meet their nutrient needs. Suggesting also that an increase in household dietary diversity corresponds to increased intake from different foods which is needed to meet nutrient needs (Hoddinott and Yohannes, 2002).

Results from the logistic regression also revealed that children living in households with high dietary diversity were more likely to have a high dietary diversity in comparison to those in households with low dietary diversity. Again suggesting that children who are dependent on family foods (as seen in the age group of the study children) are more likely to have a high dietary diversity if the households to which they belong to also has a high dietary diversity. From literature, several factors have been found to affect child dietary diversity such as household income (Eloranta *et al*., 2011), caregiver education (Eloranta *et al*., 2011; Armar-Klemesu *et al*., 2000), sex of child and number of children living in the household (Chaudhury, 1984). The present study on the other hand, did not find any of these factors to be significant after accounting for them in the model.

Additionally, further analysis showed a significant and positive correlation between household dietary diversity and child dietary diversity showing that about 42.6% of the child dietary diversity was explained by household dietary diversity. This then denotes that household dietary diversity may be used as a determinant for child dietary diversity.

5.5 Relationship between household dietary diversity and children's nutritional status

Findings from this study did not show any association between household dietary diversity and nutritional status of the children. Although it was surprising to observe no association, similar studies by McDonald *et al*., (2014) who assessed the dietary diversity of 900 households in rural Cambodia also reported no significant association between household dietary diversity and nutritional status of the children. This agreed with Ali *et al*., (2013) who also found that dietary diversity did not mediate the effect of household foods security on child stunting or wasting in Bangladesh, Ethiopia, and Vietnam. This could mean that the nutritional status of children does not necessarily depend on household dietary diversity. Evidence on this topic is however mixed. An inverse association between dietary diversity and the risk of child stunting has been reported elsewhere in Cambodia by Darapheak *et al*., (2013) and in Bangladesh by Rah *et al*., (2010). Notwithstanding, a lack of diversity in young children, may be problematic since they need energy and an array of essential nutrients from a diversified diet for rapid mental and physical development (Arimond and Ruel, 2004).

5.6 Relationship between nutritional knowledge of caregiver and child's dietary diversity

The study indicated a marginal significant association between caregiver's nutritional knowledge and child's dietary diversity. Caregivers in the study indicated a good knowledge of food sources rich in the three macro nutrients and this could have influenced them in providing more and different foods for their children thus enhancing their nutrient adequacy (Kennedy *et al*., 2007). The tendency for caregivers with high nutritional knowledge to be more likely to have children with high dietary diversity found in the study goes to show that the nutritional knowledge of caregivers play a pivotal role in making either healthy or unhealthy food choices which may translate to the quality of foods eaten in the household and

especially by the children. Studies on the association between nutritional knowledge of caregivers and child dietary diversity is however limited but other studies similar to that have shown a significant association between caregiver nutritional knowledge and diets of preschool children (Variyam *et al*., 1999); their results revealed that a higher level of maternal knowledge was associated significantly (p= 0.01) with better diet quality of children aged 2-5 years and vice versa. Yabancı *et al*., (2014) similarly indicated that that mothers with higher nutritional knowledge level had higher percentiles about preparing at least 3 portion vegetables, 2 portion fruit, and salads in each meal for their children and had normal body weight than those with low nutritional knowledge level ($p<0.05$).

5.7 Relationship between nutritional knowledge of caregiver and nutritional status of children

There was no significant association observed between caregiver's nutritional knowledge and nutritional status of the children in this present study. This result did not differ from (Lakshmi *et al*., 2003) whose research also indicated that there was no significant association between mother's knowledge on nutrition and the nutritional status of the children ($\chi 2 = 7.43$). Contrary to this, studies in Ghana (Appoh and Krekling. 2005), revealed that while investigating the relationship between mother's nutritional knowledge, education, and child nutritional status, nutritional knowledge scores were found to be significantly and independently associated ($P< 0.001$) with nutritional status of the child. Similarly, another study in Ghana that assessed the relationship between caregiver's nutritional knowledge in childcare practices and growth of children found a significant positive association ($p = 0.05$) with HAZ of the children (Saaka, 2014) consistent with findings from (Webb and Block, 2003). The disparity between the studies could be attributed to methodological differences used in assessing the nutritional knowledge of the caregivers. It should be noted though that

inadequate nutritional knowledge of the caregiver could account for inadequate dietary intake and poor nutrition in children. This agrees with a Nepalese study of school aged children (Joshi *et al*., 2011) which found that 58% of mothers (n = 205) with inadequate knowledge of dietary requirements of their children and nutritional value of foods had stunted or wasted children compared to those with adequate nutritional knowledge ($\chi 2 = 6.84$; $p<0.005$); It was also found that caregivers in their study with inadequate nutritional knowledge were more likely (OR: 1.53, 95% CI: 1.1-2.14) to have children who were malnourished compared to those with adequate dietary knowledge.

CHAPTER 6

6.0 CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

6.1 Conclusions

At least 90% of all households and children consumed more from starchy staples compared to other food groups as observed in most developing countries. A higher proportion of households (65.5%) consumed from ten or more food groups in the past seven (7) days indicating that more households in the Asesewa sub-district had a high dietary diversity.

Results also showed that more than 50% of the children had higher dietary diversity having consumed seven (7) or more food groups in the past seven (7) days. However, they rarely consumed dairy products and organ meat was found to be the least food group consumed. A majority of the children met or exceeded the EAR for protein, energy and carbohydrate but very few met the requirement for vitamin C (27.3%) and calcium (3.6%).

Findings revealed that malnutrition existed among the study children. The prevalence of stunting (23.6%), underweight (4.2%) and overweight (3%) reported in the study was however found to be lower than estimates from national level and other studies.

Studies provided evidence of a significant association ($p<0.001$) between household dietary diversity and child dietary diversity but no significant association with nutritional status of the children. Households with more diverse diets were associated with higher dietary diversity of the children and had an almost six-fold likelihood of having children with high dietary diversity (OR: 5.7; CI: 2.78 - 11.84).

Additionally, a significant positive correlation ($r = 0.653$, $p<0.001$) found between household dietary diversity and child's dietary diversity may indicate that household dietary diversity can be used as a moderate predictor of child dietary diversity.

The nutritional knowledge of the caregivers did not influence the quality of diet of the children to a large extent (no significant association). There was also no significant association between nutritional knowledge of caregivers and the nutritional status of the children.

It is worth noting that ensuring the adequacy and quality of diet of children who have been weaned and are dependent on household foods may lead to decreased risk of malnutrition and reduce the chances of many of them entering into school age with some nutritional deficits.

6.2 Limitations

The reference period used in this study for collecting dietary information was seven (7) days which is longer than used in other studies. Thus it may have been cumbersome for caregivers to recall foods eaten in the past seven (7) days which may have led to under or over reporting of foods consumed.

Another limitation was that, a single 24-hour recall method was used in determining energy and nutrient intakes of the children and therefore may not have been able to provide an indication of the children's habitual energy and nutrient intakes.

6.3 Recommendations

Considering the low proportion of children meeting the EARs for calcium, caregivers should be encouraged to incorporate more dairy products into the diets of their young children and in so doing boast their calcium levels and prevent deficiency related issues.

It is recommended that for a similar study, the reference period for collecting dietary information be made shorter to reduce respondent burden and possible errors.

Even though more of the study children were found to have a high dietary diversity and consumed from fruits and vegetables, a little over 50% were found to be vitamin A

sufficient and this creates an inconsistency thus further studies could be conducted to probe and find reasons for it.

Given that a single 24-hour recall does not indicate habitual dietary intake, similar studies should look at using a repeated 24-hour recall to better reflect the dietary intake of respondents.

Since the nutritional knowledge of caregivers play a pivotal role in making either healthy or unhealthy food choices which affects overall nutritional status, interventions targeted at caregivers in the Asesewa sub-district should include integrated nutrition education to improve on their nutritional knowledge.

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Appendix 1: Consent Form

Title: Association between Household Food Consumption and Dietary Intake of 3-6 Year Old Children in Asesewa Sub-District.

Principal Investigator: Isabella Tandoh (Graduate student)

Address: Department of Nutrition and Food Science

University of Ghana

P.O. Box LG134

Legon-Accra

General Information about Research

I would like to tell you about this research study that will involve your participation. The purpose of this study is to find the relationship between the foods consumed in the households and the dietary intake and habits of children 3-6 years living in Asesewa sub-district.

If you agree to participate in this study, you will be visited in your home not more than once. You will be asked questions about your personal and household characteristics such as your age, marital status, education, amount of income you earn and number of people living in your household. Other questions such as foods that are eaten by your household, by your child and the number of times these foods are eaten will also be asked. This will take about 30-40 minutes of your time. Later, your height and weight measurements will be taken to assess your nutritional status.

Possible Risks and Discomforts

There are no risks to you as a result of your participation. You might however be inconvenienced because about 40 minutes of you time will be taken**.**

Possible Benefits

There are no direct benefits to you for participating in this study. However, the knowledge gained from this study will help in determining the dietary intake, habits and nutritional status of children after they have fully transitioned into family foods.

Confidentiality

Any information obtained from your participation in this study will be kept strictly confidential and used for research purposes only. Your name will in no way be used in any reports from the study.

Compensation

At the end of the interview, you will be given two bars of geshia soap in appreciation of your time and effort.

Voluntary Participation and Right to Leave the Research

You are free to participate in this study or not. You can chose to withdraw from this study at any stage. It will not go against you in any way should you decide leave the study.

Contacts for Additional Information

If you have any questions or concerns regarding the study, please feel free to contact any of us.

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Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR-IRB). If you have any questions about your rights as a research participant you can contact the IRB Office between the hours of 8am-5pm through the landline 0302916438 or email addresses:

nirb@noguchi.mimcom.org

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title ***(Association between Household Food Consumption and Dietary Intake of 3-6 Year Old Children in Asesewa Sub-District)*** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

_____ _____

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person Who Obtained Consent

Appendix 2: Parental Consent Form

Title: Association between Household Food Consumption and Dietary Intake of 3-6 Year Old Children in Asesewa Sub- District.

Principal Investigator: Isabella Tandoh (Graduate student)

Address: Department of Nutrition and Food Science
University of Ghana
P.O. Box LG134
Legon-Accra

General Information about Research

I would like to tell you about this research study that will involve your child. The purpose of this study is to find the relationship between the foods consumed in the households and the dietary intake and habits of children 3-6 years living in Asesewa sub-district.

If you agree for your child to participate in this study, you will be visited in your home not more than once. You will be asked some questions about the foods that your child eats at home and the number of times these foods are eaten. This will take about 30-40 minutes. Later the height and weight measurements of your child will be taken to determine nutritional status.

Possible Risks and Discomforts

There are no risks to your child as a result of his/her participation. There might be some inconveniences since some time may be spent in taking your child's measurement**.**

Possible Benefits

There are no direct benefits to your child for participating in this study. However, the knowledge gained from this study will help in determining the dietary intake, habits and nutritional status of children after they have fully transitioned into family foods.

Confidentiality

Any information obtained from your child will be kept strictly confidential and used for research purposes only. His/her name will in no way be used in any reports from the study.

Compensation

At the end of the study, your child will be given two bars of geshia soap.

Voluntary Participation and Right to Leave the Research

Your child is free to either participate in this study or not. Your child can chose to withdraw from this study at any stage. Should he/she decide to participate or leave the study, it will in no way go against them.

Contacts for Additional Information

If you have any questions or concerns regarding the study, please feel free to contact any of us.

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Your Child's Rights as a Participant

This research has been reviewed and approved by the Noguchi Memorial Institute for Medical Research Institutional Review Board (NMIMR-IRB). If you have any questions about your child's rights as a research participant you can contact the IRB Office between the hours of 8am-5pm through the landline 0302916438 or email addresses: nirb@noguchi.mimcom.org .

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title ***(Association between Household Food Consumption and Dietary Intake of 3-6 Year Old Children in Asesewa Sub-District)*** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree that my child should participate as a volunteer.

_____ _____

Date Name and signature or mark of parent or guardian

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the child's parent or guardian. All questions were answered and the child's parent has agreed that his or her child should take part in the research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

_____ _____

Date Name Signature of Person Who Obtained Consent

Appendix 3: Caregiver and Child Questionnaire

Section A: Background Information: Socio-demographic Characteristics

1. Name of index child:……
2. Index child ID:……
3. Sex of Index child 1) Male 2) Female
4. Age of Index child:……. (years)
5. Date of birth of index child (dd/mm/yyyy): ___ ___ / ___ ___ / ___ ___
6. What is your relationship to the index child?
   1=Mother 2 = Father 3= Older sibling 4= Grandparent
   5= Aunty/Uncle 6=Other (specify)
7. How old are you?.....
8. Which ethnic group do you belong to?
   1= Akan 2=Ewe 3=Krobo 4= Other (specify)
9. What is your religion?
   1=Christian 2=Islam 3= Other (Specify) ……
10. What is your highest level of education?
    1=Primary 2=JHS/Middle School 3= SHS/Secondary
    4= Vocational 5= Post Secondary(Tertiary)
11. What is your primary occupation?
    1= Trader 2= Teacher 3= Farmer 4= Vocational* 5= Housewife
    7= Other (Specify)……..
    *caterer, baker, seamstress and hairdresser
12. What is your monthly income?
    1= <GH 100 2= GH 100-200 3= GH 300-400 4= >400
13. What is your marital status?
    1= Single 2= Married 3= Divorced/Separated 4 = Widowed

Section B : Household Characteristics

14. Who is the main provider of the household……..

15. What is his or her relationship to the index child?
    1=Mother 2 = Father 3= Older sibling 4= Grandparent
    5= Aunty/Uncle 6=Other (specify)

16. What is his or her primary occupation?
    1= Trader 2= Teacher 3= Farmer 4= Vocational* 5= Housewife
    7= Other (Specify)……..
    *caterer, baker, seamstress and hairdresser

17. What is his or her monthly income?
    1= <GH 100 2= GH 100-200 3= GH 300-400 4= >400

18. How much income do you spend on food in a week? GH ……..

19. How many children (<18) are in your household?.....……

20. How many adults are in your household?.....

21. What is the total number of people living in the household? …….

22. Do you own the house you are live in?.....
    1= Yes 2= No

23. What is the main source of drinking water in your household?
    1= Pipe-borne water 2= Well/borehole 3= River/stream
    4= Rain water 5= Other(Specify)……

24. Where is the source of drinking water located?
    1= Inside own house 2= A few meters from own house 3= Far from own house
    4= Other (Specify)

25. Please specify if these assets are in your household

	Asset	Available	Functioning
		Yes =1, No=0	Yes=1, No=0
A	Radio/Sound system		

B	Refrigerator		
C	Television		
D	Telephone/Mobile phone		
E	Bicycle		
F	Motorcycle		
G	Private vehicle		
H	Commercial Vehicle		

26. Please specify if any of these domestic animals are in your household

Domestic animal	Yes= 1	No=0
Poultry		
Goats		
Sheep		
Pigs		
Cattle		

Section C: Morbidity Surveillance

27. Has your child been sick of the following in the past two weeks?

Morbidity	Yes[1]	No[0]
Fever		
Diarrhoea		
Fast breathing/shortness of breath		
Cough		

28. If Yes, did you seek any advice or treatment for fever?
1= Yes 2= No 3= Not applicable

29. If Yes, did you seek any advice or treatment for diarrhoea?
1= Yes 2= No 3= Not applicable

30. If Yes, did you seek any advice or treatment for fast breathing/shortness of breath?
1= Yes 2= No 3= Not applicable

31. If Yes, did you seek any advice or treatment for the cough?
1= Yes 2= No 3= Not applicable

32. If Yes (to question 28) from where did you seek advice or treatment?
1= Hospital/clinic 2= Pharmacy 3= Traditional Practitioner 4= Friend
5= Other(specify)…… 6= Not applicable

33. If Yes (to question 29) from where did you seek advice or treatment?
1= Hospital/clinic 2= Pharmacy 3= Traditional Practitioner 4= Friend
5= Other(specify)…… 6= Not applicable

34. If Yes (to question 30) from where did you seek advice or treatment?
1= Hospital/clinic 2= Pharmacy 3= Traditional Practitioner 4= Friend
5= Other(specify)…….. 6= Not applicable

35. If Yes (for question 31) from where did you seek advice or treatment?
1= Hospital/clinic 2= Pharmacy 3= Traditional Practitioner 4= Friend
5= Other(specify)……. 6= Not applicable

Section D: Nutritional Knowledge of Caregiver

.

36. Cassava, Yam and Gari are rich sources of:
1= Protein 2= Carbohydrates 3= Fats 4= Iodine 5= Don't know

37. Chicken, Eggs and Fish are rich sources of:
1= Protein 2= Carbohydrates 3= Fats 4= Iodine 5= Don't know

38. Which of the following is a rich source of fat?
1= Orange 2= Margarine 3= Carrot 4= Rice 5= Don't know

39. Milk and milk products are rich in
1= Sodium 2= Calcium 3= Iron 4= Zinc 5= Don't know

40. Which of the following is a rich source of iron?
1= Meat 2= Tomatoes 3= Carrot 4= Rice 5= Don't know

41. Which of the following is a rich source of dietary fibre/roughage?
1= Wheat 2= Cheese 3= Groundnut 4= Beef 5= Don't know

42. Kwashiorkor is caused by inadequate intake of:
1= Protein 2= Carbohydrates 3= Vitamin A 4= Vitamin K 5=Don't know

43. Rickets/ bow legs in children are caused by lack of
1=Vitamin K 2=Vitamin D 3=Vitamin E 4= Vitamin A 5= Don't know

44. Goiter is caused by lack of:
1= Iodine 2= Iron 3= Calcium 4= Sodium 5= Don't know

45. Bleeding of gums is caused by inadequate intake of:
1=Vitamin C 2= Vitamin K 3= Vitamin E 4= Vitamin A 5= Don't know

46. When serving food at home, who do you think should get the greatest portion of fish?
1= Father 2= Mother 3= Older children 4= Young children 5= Don't know

47. Do you think fruits and vegetables must be eaten frequently?
1= Yes 2= No 3= Don't know

Section E: 24 hour recall questionnaire

Please describe the foods (meals and snacks) that was eaten or drank yesterday by your child during the day and night, whether at home or outside the home. Ingredients for composite dishes should also be provided.

Meal	Time	Place of consumption	Description of food	Amount consumed	Dietary Intake (in grams)
Breakfast					
Snack					
Lunch					
Snack					
Supper					
Snack					

Section F: Household Food Frequency Questionnaire

Now I would like to ask you some questions about foods eaten in your household in the **last seven days**, since last [SAY DAY, SAME AS INTERVIEW DAY]. For each food I ask about, please tell me how many days in the last seven days you think you ate that food. I would like to know if you ate the food, even if it was combined with other foods in a recipe. For example, if you ate a stew or soup made with chicken, onions, and tomatoes, you should say "yes" when I ask about meat from birds, and again "yes" when I ask about vegetables. However, if you only had the soup, not the chicken, do not say "yes" to the meat from birds because you did not eat it.

For each item on the list, read the question below and fill in the number of days the mother says (0-7). If the mother does not know, write "9".

Over the past 7 days, that is, since last [day of week seven days ago] up until last night when you slept, did anyone in your household consume any […]?	[1] Yes [0] No (>>Next Item)	Number of days food was consumed
1. Cereals and Cereal Products		
[101] Guinea corn/Sorghum		
[102] Maize/corn dough		
[103] Millet		
[104] Rice (local and imported)		
[105] Bread, buns		
[106] Biscuits		
[107] Flour (wheat)		
[108] Baby food (cerelac, etc)		
[109] Other cereal products (specify)		
2. Meat: Live, Fresh, Frozen, Processed		
[201] Corned beef		
[202] Pork		
[203] Beef		
[204] Goat meat		
[205] Mutton		
[206] Bushmeat/wild game		
[207] Other meat (dog, cat, etc) (specify)……		
3. Poultry and eggs		
[301] Chicken		
[302] Game birds		
[303] Eggs		
[304] Other poultry		

4. Fish: Fresh, Dried, Smoked, Fried		
[401] Crustaceans (lobster, crab, etc)		
[402] Fish (fresh, dried, smoked, fried)		
[403] Fish (canned)		
[404] Fish (salted)		
[405] Other fish (specify)		
5. Milk and Milk Products		
[501] Fresh milk		
[502] Milk powder		
[503] Baby milk		
[504] Tinned milk		
[505] Other milk products (specify)		
6. Oils and Fats		
[601] Coconut oil		
[602] Palm kernel oil		
[603] Palm oil		
[604] Margarine/butter		
[605] Other vegetable oil and fats (specify)		
7. Fruits		
[701] Coconut		
[702] Banana		
[703] Orange/tangerine		
[704] Pineapple		
[705] Mango		
[706] Avocado pear		
[707] Watermelon		
[708] Pawpaw		
[709] Other fruits not canned (specify)		
[710] Canned or processed fruits		
8. Vegetables and Mushrooms		
[801] Cocoyam leaves (kontomire)		
[802] Garden eggs		
[803] Okro		
[804] Carrots		
[805] Pepper (fresh or dried)		
[806] Onions		
[807] Tomatoes (Fresh)		
[808] Tin tomatoes		
[809] Mushrooms		
[810] Other vegetables (specify)……		
9. Starchy Staples		
[901] Cassava		

[902] Cocoyam		
[903] Plantain		
[904] Yam		
[905] Cassava dough		
[906] Gari		
[907] Sweet potato		
[908] Other starchy staples (specify)		
10. Pulses and Nuts		
[1001] Beans		
[1002] Groundnuts (roasted, raw, or paste)		
[1003] Palm nuts		
[1005] Other pulses and nuts (specify)		
11. Spices, Sugars, and Sweets		
[1101] Salt		
[1102] Maggie, Royco		
[1103] Curry powder		
[1104] Ginger		
[1105] Sugar (cube, granulated)		
[1106] Honey		
[1107] Jam		
[1108] Fanice, FanYogo		
[1109] Chocolate		
[1110] Others(specify)		
12. Beverages		
[1201] Coffee, tea, milo		
[1204] Minerals (fanta, coke, malta 82uinness)		
[1206] Fruit juices		
[1207] Mineral water (bottle and sachet)		
[1208] Schnapps, gin, whisky		
[1209] Palm wine, pito		
[1211] Akpeteshie and other local spirits		
[1213] Beer and Guinness		
[1215] Other beverages (specify)		

Child Food Frequency Questionnaire

Interviewer: I would like to ask you some questions about foods your child ate in the last seven days, since last [SAY DAY, SAME AS INTERVIEW DAY]. For each food I ask about, please tell me how many days in the last seven days you think the child ate that food. [For each item on the list, read the question below and fill in the number of days (0-7) the mother says. If the mother does not know, circle "9".

Over the past 7 days, that is, since last [day of week seven days ago] up until last night when you slept, did anyone in your household consume any […]?	[1] Yes [0] No (>>Next Item)	Number of days food was consumed
1. Cereals and Cereal Products		
[101] Guinea corn/Sorghum		
[102] Maize/corn dough		
[103] Millet		
[104] Rice (local and imported)		
[105] Bread, buns		
[106] Biscuits		
[107] Flour (wheat)		
[108] Baby food (cerelac, etc)		
[109] Other cereal products (specify)		
2. Meat: Live, Fresh, Frozen, Processed		
[201] Corned beef		
[202] Pork		
[203] Beef		
[204] Goat meat		
[205] Mutton		
[206] Bushmeat/wild game		
[207] Other meat (dog, cat, etc) (specify)		
3. Poultry and eggs		
[301] Chicken		
[302] Game birds		
[303] Eggs		
[304] Other poultry		
4. Fish: Fresh, Dried, Smoked, Fried		
[401] Crustaceans (lobster, crab, etc)		
[402] Fish (fresh, dried, smoked, fried)		
[403] Fish (canned)		

[404] Fish (salted)		
[405] Other fish (specify)		
5. Milk and Milk Products		
[501] Fresh milk		
[502] Milk powder		
[503] Baby milk		
[504] Tinned milk		
[505] Other milk products (specify)		
6. Oils and Fats		
[601] Coconut oil		
[602] Palm kernel oil		
[603] Palm oil		
[604] Margarine/butter		
[605] Other vegetable oil and fats (specify)…….		
7. Fruits		
[701] Coconut		
[702] Banana		
[703] Orange/tangerine		
[704] Pineapple		
[705] Mango		
[706] Avocado pear		
[707] Watermelon		
[708] Pawpaw		
[709] Other fruits not canned (specify)		
[710] Canned or processed fruits		
8. Vegetables and Mushrooms		
[801] Cocoyam leaves (kontomire)		
[802] Garden eggs		
[803] Okro		
[804] Carrots		
[805] Pepper (fresh or dried)		
[806] Onions		
[807] Tomatoes (Fresh)		
[808] Tin tomatoes		
[809] Mushrooms		
[810] Other vegetables (specify)		
9. Starchy Staples		
[901] Cassava		
[902] Cocoyam		
[903] Plantain		
[904] Yam		
[905] Cassava dough		

[906] Gari		
[907] Sweet potato		
[908] Other starchy staples (specify)		
10. Pulses and Nuts		
[1001] Beans		
[1002] Groundnuts (roasted, raw, or paste)		
[1003] Palm nuts		
[1005] Other pulses and nuts (specify)		
11. Spices, Sugars, and Sweets		
[1101] Salt		
[1102] Maggie, Royco		
[1103] Curry powder		
[1104] Ginger		
[1105] Sugar (cube, granulated)		
[1106] Honey		
[1107] Jam		
[1108] Fanice, FanYogo		
[1109] Chocolate		
[1110] Others(specify)		
12. Beverages		
[1201] Coffee, tea, milo		
[1204] Minerals (fanta, coke, malta guinness)		
[1206] Fruit juices		
[1207] Mineral water (bottle and sachet)		
[1208] Other beverages (specify)		

When the recall is complete, fill in the food groups based on the FFQ for the household

Number	Food group	Examples	Yes=1, No= 0
1	Cereals and grains	corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, porridge or other grain products	
2	Roots and tubers	Cassava, plantain, Potatoes, Sweet potatoes, yam	
3	Vitamin A rich vegetables and tubers	pumpkin, carrot, squash, sweet potato that are orange inside, red pepper	
4	Dark green leafy vegetables	Cocoyam leaves, alfafa leaves, dandelion, bitter leaf, lettuce	
5.	Other vegetables	Onion, garden eggs, garlic, cabbage, green pepper	
6	Vitamin A rich fruits	Pawpaw, mango, 100% fruit juice made from these	
7	Other fruits	Apple, banana, coconut, grapes, guava, lemon, pineapple, tangerine, watermelon	
8	Meat	Organ meat, pork, goat, lamb, mutton, poultry	
9	Eggs		
10	Fish and sea foods	Fresh or dried, canned fish, octopus, shrimps	
11	Legumes nuts and seeds	Ground nut, beans (any type), soybeans, cashew, almonds	
12	Milk and milk products	Powdered milk, whole milk, cheese, low fat	
13	Oil and fats	Vegetable oil, palm oil, coconut oil, butter, margarine	
14	Sweets	Sugar, honey, candies, cookies sweetened soda,	
15	Condiments , spices, beverages	Spices (black pepper, salt), condiments, coffee, tea, alcoholic beverages	

Number of food groups consumed ……

When the recall is complete, fill in the food groups based on the FFQ for the child

Number	Food group	Examples	Yes=1, No= 0
1	Cereals and grains	corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, porridge or other grain products	
2	Roots and tubers	Cassava, plantain, Potatoes, Sweet potatoes, yam	
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5.	Other vegetables	Onion, garden eggs, garlic, cabbage, green pepper	
6	Vitamin A rich fruits	Pawpaw, mango, 100% fruit juice made from these	
7	Other fruits	Apple, banana, coconut, grapes, guava, lemon, pineapple, tangerine, watermelon	
8	Meat	Organ meat, pork, goat, lamb, mutton, poultry	
9	Eggs	From any kind of bird	
10	Fish and sea foods	Fresh or dried, canned fish, octopus, shrimps	
11	Legumes nuts and seeds	Ground nut, beans (any type), soybeans, cashew, almonds	
12	Milk and milk products	Powdered milk, whole milk, cheese, low fat	
13	Oil and fats	Vegetable oil, palm oil, coconut oil, butter, margarine	
14	Sweets	Sugar, honey, candies, cookies sweetened soda,	
15	Condiments , spices, beverages	Spices (black pepper, salt), condiments, coffee, tea, alcoholic beverages	

Number of food groups consumed ……

Section F: Circle the correct answer for each question. If respondent answers 'Yes' to any of Q 48 to Q 52, complete the appropriate forms on second questionnaire

48. Is index child attending school?
    1= Yes 2=No *If No, do not complete rest of the questions*

49. Is index child given money when going to school?
    1= Yes 2= No

50. How much is given for school?
    1= <GH 1.00 2= GH 1.00 - 2.00 3= >2.00

51. Does caregiver pay feeding fees?
    1= Yes 2= No

52. Did index child eat from the school canteen the previous day?
    1= Yes 2= No

53. Does index child take food to school?
    1= Yes 2= No

Section G: Anthropometric Measurements

Caregiver Anthropometry

Measurement	**1st reading**	**2nd reading**
Weight(kg)		
Height(cm)		

Child Anthropometry

Measurement	**1st reading**	**2nd reading**
Weight (kg)		
Height(cm)		

FORM B: Dietary intake at school (Child given money to school)

This table should be filled if child is given money to school
Observe and record all foods bought and consumed by the child

Time of purchase	Item purchased	Amount purchased	Quantity consumed by child

FORM C: Dietary intake at school (meals provided by school)

This table should be filled if caregiver pays feeding fees.
Weigh and record all foods on the school menu that was consumed by the child

Meal			
Time eaten			
Description of food			
Weight of empty bowl (A) /g			
Weight of empty bowl + food (B)/g			
Weight of food served /g. (B-A)			
Weight of leftover/g			
Weight of food consumed/ g (weight of food served-leftover)			

FORM D: Dietary intake at school (child takes food to school)

This table should be filled if the child takes food to school.
Please describe all foods that the child took to school yesterday and the amount that was leftover

Food	Description of food	Amount served	Amount leftover	Amount consumed