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ASSESSMENT OF DIETARY INTAKES AND NUTRITIONAL STATUS OF SCHOOL AGE CHILDREN PARTICIPATING IN SCHOOL FEEDING PROGRAMMES AT OTINIBI AND DANFA

BY

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DECLARATION

I, Justina Serwaah Owusu declare that this thesis is the results of my own work produced from research under the supervision of Dr. Esi Colecraft and Dr. Richmond Aryeetey. All references to other works have been duly acknowledged.

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ABSTRACT

Background: School age children (SAC) are vulnerable to malnutrition which can negatively influence their growth and maturity, health and academic attainment. School feeding programmes (SFP) have the potential to improve dietary intakes and nutrition of SAC. However there is limited information on the nutritional impact of school feeding programmes in Ghana.

Objective: The aim of this study was to determine the dietary intakes and nutritional status of SAC participating in an NGO-sponsored (NSFP) and a Government-sponsored (GSFP) school feeding programme in two semi-rural communities in Ghana.

Methodology: A cross sectional survey was used to obtain data from 182 school age children (SAC) and caregiver pairs. Structured questionnaires were used to interview the SAC and caregivers on their socio-demographic characteristics and dietary practices. The 24hour dietary recall method was used to collect data of the children's dietary intakes on 2 non-consecutive days. Children's weight and height measurements were taken and anthropometric indices (stunting, BMI for age) were computed. The hemocue method was used to assess haemoglobin levels on a sub-sample of children. Predictors of nutritional status of SAC were assessed using linear and logistic regression models. T-test was used to test the differences in school performance and attendance of children who have normal nutritional status and those with at least one nutritional deficit.

Results: The mean dietary diversity scores for all the SAC was 5±1 out of 9 food groups. Diets of SAC were low in organ meats, dairy products, eggs and dark green leafy vegetables. SAC met all the DRI for energy and nutrients (protein, iron, zinc, vitamin C and A) intake except for calcium intake. Portion sizes of GSFP meals served to SAC were significantly lower (243 ± 50g vs. 416 ± 96g; p=0.012) than NSFP. Meals provided by the NSFP met recommendations for

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energy and macronutrient content of school meals whiles those provided by the GSFP did not. Dietary intakes of NSFP participants were higher than GSFP. NSFP contributed significantly higher energy (28 ± 10% vs. 16.2 ± 7%; p=<0.001), protein (24.6 ± 9% vs. 13.3 ± 7%; p=<0.001) and micronutrients (p≤0.042) to the children's total energy intakes compared to meals provided through the GSFP. 67.0% of SAC were either anaemic, stunted or had low BMI for age. Haemoglobin level was lower among SAC who have received any micronutrient supplement in the past 6 months (β=-0.900; p=0.009)and SAC whose caregivers education was lower than JHS (β=-1.050; p=0.002). Younger age (<10yrs) was associated with high BMI for age (β=0.342, p=0.10) .BMI for age and height for age of SAC were not affected by energy intake (β=0.000; p=≤0.046).Also, younger age (<10yrs), caregivers not working or engaged in occupation (trader and vocational occupation) and educational level higher than JHS were associated with HAZ of SAC (p<0.05). The significant predictors for having at least one nutritional deficit among SAC wereyounger age (odds ratio=0.485; CI=0.243-0.969; P=0.040) and caregivers engaged in other occupationsuch as farmers, stone winnowers and professional workers (odds ratio=3.499; CI=1.065-11.491; p=0.039). None of the nutritional indices that SAC were assessed on was significantly associated with school attendance and performance in the past term. However, there was significant association between having at leastone nutritional deficit and school performance in Mathematics (Mean difference=-4.62; p=0.037) and English (Mean difference=-4.49; p=0.027) but not Science in the past term.

Conclusion: Malnutrition was prevalent among the SAC. Both GSFP and NSFP were contributing to daily intakes of SAC. However, the quantity of food served by GSFP need to be reviewed to increase its contribution to daily nutrient intakes.

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DEDICATION

To Dr. Esi Komeley Colecraft, who suggested the research area and provided funds and other resources that made this work a reality.

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LIST OF ABBREVIATIONS

BAZ	Body Mass for Age Z scores
BMI	Body mass index
CI	Confidence interval
cm	centimeter
DRI	Dietary Recommended Intakes
FFP	Food for the People
HAZ	Height for Age Z scores
FAO	Food and Agricultural Organisation
GHS	Ghana Health Service
GSFP	Ghana School Feeding Programme
GSS	Ghana Statistical Service
Hb	Haemoglobin
kg	kilogrammes
km	Kilometres
MDG	Millennium Development Goals
NGO	Non-Governmental Organisatiom
NSFP	NGO School Feeding Programme
SAC	School Age Children
SFP	School feeding programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WFP	World Food Progamme
WHO	World Health Organisation

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CHAPTER 1

1.0 INTRODUCTION

1.1 Background

Malnutrition among school age children (SAC) is a public health problem in developing countries (Best et al., 2010). The most commonly reported nutritional problems among school age children include underweight and micronutrient deficiencies of iron, zinc, iodine and vitamin A (Best et al., 2010). While nationwide data on the nutritional status of Ghanaian school age children is currently unavailable, a research study in the Eastern region of the country found that 44% of the 645 rural SAC assessed were stunted and 70% of them were anaemic (Fentiman et al., 2001).

Given the high burden of malnutrition in the preschool years in developing countries, the high prevalence of malnutrition among SAC may partly be a reflection of residual malnutrition from the preceding life stage (Partnership for Child Development (PCD), 2002). In Ghana 14% and 28% of preschool age children (<5years) are underweight and stunted, respectively (GSS and GHS, 2009). Uncorrected malnutrition in the preschool age years means that many children may be entering their school years with nutritional deficits. Thus, the high levels of malnutrition among preschool age children in the country warrant concern for the health and wellbeing of SAC because most nutrition interventions are targeted at preschool age children and not SAC (Bundy et al., 2009).

Malnutrition has negative impact on the health of SAC and affects their capacity to succeed in school. Researchers have reported a link between malnutrition and poor school attendance and achievement among school age children (Omwami et al., 2011 and Mukudi, 2003). In a study of primary school children in Iraq, children who were malnourished (low BMI

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for age) were reported to be 11.6 times at risk of low intelligence than normal children (Ghazi et al., 2012). In the same study of primary school children in Iraq, IQ scores were identified to be reduced by 7.3points for malnourished children (Ghazi et al., 2012). In Ethiopia, food insecure children were found to absent themselves from school about twice (33%) more than their colleagues who were food secured (17.8%) at $P < 0.001$(Belachew et al., 2011).

In order to mitigate hunger and its subsequent effect on nutritional status and development of SAC, school feeding programs (SFP) has been established. Globally, the World Food programme (WFP) has been very instrumental in implementing school feeding programmes. School feeding programs (SFP) as an intervention contribute to improving the nutritional status of SAC by eliminating hunger in the short term. In a systematic review of school feeding programmes by Kristjansson et al., (2007), they reported improvements in weight, height especially in younger children, attendance, mathematics performance, bone mineral density, arm muscle, concentrations of B – vitamins and behaviour in school children participating in SFP.

Ghana school feeding programme (GSFP) is an initiative by the government of Ghana in 2005 to curb hunger and malnutrition through the provision of nutritious meal prepared from locally-grown foodstuffs on school days (GSFP, 2010). Primarily, GSFP seeks to contribute to poverty reduction and increase food security in Ghana (GSFP, 2010). As at 2009, the GSFP had contributed to 20-25% increase in enrolment and 90-95% increase in school attendance and retention since its inception (GSFP, 2010).

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1.2 Rationale

School age children (SAC) are vulnerable to malnutrition which can have adverse effects on their performance at school. School Feeding Programmes have been proven to have potential effect on health and educational performance of SAC. In Ghana, large scale evaluation of SFP has centred on enrolment and attendance. Dietary variables and nutritional impact have received little attention. Also, there is limited documentation on the dietary habits and nutritional status of SAC in Ghana.

Thus, this present study sought to assess nutritional status and dietary intakes of school age children participating in an NGO – run school feeding programmes (NSFP) at Otinibi and a Government – run SFP (GSFP) at Danfa.

1.3 Research Questions

The research sought to answer the following questions about school age children participating in school feeding programmes at Otinibi and Danfa:

1. What are the dietary habits and nutritional status of the school children?
2. What is the contribution of school meals to the total energy and nutrient intakes of the school children?
3. What are the determinants of the nutritional status (Body Mass Index, Height for Age and Haemoglobin level) of the school children?
4. Is there a relationship between the current nutritional status of the SAC and their school attendance and performance in the past term?

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1.4 Main objective

The main objective of the study was to assess dietary intakes and nutritional status of school age children participating in school feeding programmes at Otinibi and Danfa.

1.5 Specific Objectives

The specific objectives were;

1. To determine nutritional status and dietary habits of school age children (SAC) participating in an NGO based – School Feeding Programme (N – SFP) and a Government based – School Feeding Programme (G-SFP) at Otinibi and Danfa.

2. To assess the contribution of school meals by the two types of school feeding programmes to the total energy and nutrient intake of SAC at Otinibi and Danfa.

3. To assess the determinants of nutritional status (Body Mass Index and Haemoglobin) among SAC participating in the school feeding programmes at Otinibi and Danfa.

4. To assess whether there is an association between the children's nutritional status and attendance and performance in core subjects in the past term.

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CHAPTER 2

2.0 LITERATURE REVIEW

2.1 School Age Children

Child survival programmes have enabled more children to survive beyond their fifth birthday and so enter the next life stage, the school age. Increasing recognition of the health and nutritional vulnerability of school aged children has in recent years attracted interest in this life stage (Fentiman et al., 2001). The World Health Organisation (WHO) (2012) defines school age children (SAC) as children between the ages of 5 and 12. However, UNESCO (2006) categorises SAC into two groups; primary school-age (6 to 12 years) and secondary school-age (12 to 18years). The school age is a dynamic period of growth and development which is characterised by changes in physical, mental, emotional and social wellbeing (Srivastava et al., 2012).

2.1.1 Nutrient needs of school age children (SAC)

Throughout the school age period, children are likely to experience a period of rapid growth mask with increase appetite as well as a time of slower growth mask with a decreased appetite (Koszewski and Sehi, 2012). Thus school age children need nutrients at all these times to promote healthy growth whiles meeting their body needs as well (Koszewski and Sehi, 2012).

According to the FAO Family Nutrition Guide, the frequency of eating for older children including SAC should be 3 meals and some snacks daily (FAO, 2004a). When SAC eats the right quantities of food they may become malnourished if the food does not contain the right amount of nutrients they need (World Food programme, 2013). The consequences of not meeting nutrients among SAC include slow growth, less energy for activities such as playing,

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studying or any form of physical activity as well as anaemia or any other form of illness (FAO, 2004a).

Energy needed for optimum growth of SAC is in two components that is: (i) energy used to synthesize growing tissues and energy stored in those tissues (FAO, 2004b). FAO recommends the calories below as energy requirements for school children based on their age and sex (FAO, 2004b).

Table 2.1: Recommended Calories for School Age Children

Age (years)	Boys (kcal/kg/d)	Girls (kcal/kg/d)
6-7	72.5	69.3
7-8	70.5	66.7
8-9	68.5	63.8
9-10	66.6	60.8
10-11	64.6	57.8
11-12	62.4	54.8

According to the Tanzania Nutrition and Food Center (2006), SAC also require protective foods that are rich in vitamins (A, B, C) as well as minerals (Iron, Zinc, Iodine and others). These nutrients are very essential since they support growth and help build the immunity of SAC against diseases (Tanzania Nutrition and Food Center, 2006).

2.2 Nutritional Problems of School Age Children

Globally the major nutritional problems among SAC include under-nutrition encompassing protein energy malnutrition and micronutrient deficiencies (Partnership for Child Development

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(PCD), 2002). Increasingly issues of overnutrition encompassing overweight and obesity are also becoming a major concern among SAC particularly in countries in transition (PCD, 2002).

2.2.1 Protein Energy Malnutrition

Protein energy malnutrition in children manifests as anthropometric deficits that can range from mild to severe. This condition can result in children being underweight (low weight-for-age), wasted (low weight-for-height) or stunted (low height-for-age) compared to a reference population and is associated with increase morbidity and mortality among children. According to Buhl (2010), wasting and stunting are important nutritional problems that persist among SAC in developing countries including Sub-Saharan Africa.

In a pre-intervention baseline assessment of primary school children 6 to 9 years in Suba District in Kenya, 30% of the total sample size surveyed were stunted (Ohiokpehai et al. 2009). Also, in Nigeria, the national prevalence of underweight has been reported to be 80% among primary school pupils (FME/UNICEF, 2008 cited in Hassan et al., 2012). A study that assessed the nutritional status of 394 primary school children aged 7 to 11 years in Nigeria reported that about one half of the children were underweight and 43% of them were stunted (Hassan et al., 2012).

Also among 200 Pakistanis SAC, Mian et al., (2002) found that 44% of them had at least any nutritional deficit which was either stunted, underweight or wasted with higher proportions of under-nutrition observed among the older children (8 to 10years). Other studies have also reported PEM among SAC, In Boirahmad rural areas, Iran, an assessment of 544 school age children revealed that 15.7% of them were stunted,12.5% of them were underweight and 3.6% were wasted (Malekzadeh et al., 2003).

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In Ghana, there is limited national representative data on the nutritional status of SAC. However, a study conducted among 645 SAC at Amankwa circuit in the Eastern Regon of Ghana found 44% of them being stunted (Fentiman et al., 2001). Also, a recent study by Danquah et al., (2012), found 52.2% of primary 5 pupils who were participants and non-participants of GSFP in Ashanti region to be stunted and 46.5% of them were underweight.

2.2.2 Micronutrient deficiency

Micronutrient deficiency affects as many as two billion people in the world (WHO, 2007). About 250 million people out of this number who suffer from micronutrient deficiencies of iron, vitamin A, zinc and iodine are children (Egbi, 2012). In 2002, WHO reported that nearly 7million school children are iodine deficient worldwide. Whiles assessing the nutritional status of school age children in India, Srivastava et al., (2012), reported as many as 37% of study population being anaemic on the whole. The individual percentages were however 43% for girls and 44% for boys. These percentages were based on clinical examination of pallor on the tongue or conjunctiva (Srivastava et al., 2012).

In Ghana, the national prevalence of anaemia among school age children was found in 1995 to be 71% (FAO, 2009). The prevalence of anaemia was more severe among rural SAC (78%) than urban areas (62%). Other studies in Ghana which were not on a national scale have also found anaemia prevalence of 70 % among SAC (Fentiman et al., 2001), 72.5% among children 2-10years (Egbi, 2012) and 25% among 9months to 11years vegans and non-vegans (Osei-Boadi et al., 2012).

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2.3 Consequences of malnutrition

Globally, 852 people were estimated to be undernourished in 2000 – 2002 (FAO, 2004c). Of this number, most of them were children. This calls for concern among all stakeholders of SAC wellbeing considering the numerous negative consequences of malnutrition on SAC. Malnutrition has a negative effect on children's wellbeing and how they play and learn normally (Oldewage-Theron and Egal, 2010).

2.3.1 Physical Growth (Undernutrition: stunting, wasting) and Health outcomes

Nutritional deprivation of SAC is manifested in growth and development (Malekzadeh et al., 2003). SAC may have impaired growth. Consequences of impaired growth on physical health include underweight, stunted growth, lowered immunity, and mortality (Kristjansson, 2007).

2.3.2 Psychosocial outcomes (Mental Ability)

Chronic undernutrition that is observed in the childhood years has been linked to slower cognitive development and other health impairments later in life (Srivastava et al., 2012). Malnutrition leads to poorer cognitive functioning in school children (Thappa et al., 2009). According to Abudayya et al., 2011, "Nutritional deficiencies in childhood years can affect late behavioural development and the acquisition of social skills".

In a study of the effect of serum ferritin and haemoglobin levels on the cognitive function of 427 school children in Thailand, it was reported that cognitive function improved with increase in haemoglobin concentration of children with iron deficiency (Sungthong et al., 2002). Also, school children who were found to suffer from iron deficiency anaemia had poorer cognitive function and lower scores in mathematics and language (Sungthong et al., 2002).

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2.3.3 Educational outcomes

Malnutrition or micronutrient deficiencies lead to lower enrolment and completion rates (Thappa et al., 2009). Stunting among SAC results in a deficit in their physical and mental health (Mwaniki and Makokha , 2013). This deficit ultimately affects SAC ability to maximise learning opportunities in school. SAC may tend to have poor school attendance and performance (Omwami et al., 2011). Amongst Malaysian primary school children, it has been found that academic scores in English, Mathematics and Science increased with increasing BMI for age. Overweight children had the highest marks but scores declined among the obese children (Zaini et al., 2005).

2. 4 Factors affecting nutritional status

2. 4.1 Dietary Factors

Diet affects directly and indirectly nutritional status. It has been established that the factors that caused PEM are inclusive of inadequate dietary intake as well as abnormal gastrointestinal assimilation of food (Al-Mekhlafi et al., 2008).

2. 4.1.1 Dietary Habits

There exists a direct relationship between dietary habits during childhood years and growth, development as well as the prevalence of disease throughout the life cycle (Oldewage-Theron and Egal, 2010). Dietary habits formed during childhood ages may persist throughout the life cycle (Juan, 2006). The nutrient density of food varies based on where it is eaten whether at home or in school (Juan, 2006). In a research among SAC in Nigeria, Olusanya (2010) found that most (≥89.7%) of the meals that the children ate were at home.

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2. 4.1.2. Dietary Intake

Inadequate daily intake of food has been associated with poor health and nutritional status (Abudayya et al., 2011). This is so because some nutrients may be lacking in these type of diets. SAC, on the other hand need all nutrients in their right amount to promote healthy growth. Whiles assessing nutritional status of 394 school age children in Nigeria, Hassan et al., (2012), detected a linear relationship between nutrient adequacy of a child's diet and their nutritional status.

An important aspect of dietary intake is dietary diversity. According to FAO, (2011), dietary diversity reflects the nutrient quality of an individual's diet. In a study of 4570 SAC from Iran and India, it was reported that increasing dietary diversity scores (DDS) were associated with higher BMI of children (Hooshman and Udipi, 2013). Also, there was a positive relationship between height for age z-scores and DDS for pulses and dairy food products (Hooshman and Udipi, 2013). Also among Nigerian SAC, Olumakaiye (2013), has reported that DDS is significantly associated with lower height for age and weight for height ($p \leq 0.024$).

2. 4.1.3 Dietary Knowledge

Poor nutritional knowledge may influence people to make improper choices when they are selecting food. Studies have documented the impact of dietary knowledge on nutritional status. Once people know what is best for their health and they have made changes in their food behaviours and are food secured, they tend to improve on their nutritional status.

For SAC, the dietary knowledge of their caregivers also counts. This is so because caregivers mostly influence food that children eat at home. In a study among Nepalese SAC, it was found that 58% of mothers with stunted or wasted children did not have adequate knowledge about dietary requirements of their children and nutritional value of foods (Joshi et

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al., 2011).These caregivers with inadequate dietary knowledge were 1.53times more likely to have malnourished (stunted or wasted) children than those with adequate dietary knowledge (p-value<0.05; Joshi et al., 2011).

2. 4.2 Household Level Factors

The situation in the homes of SAC greatly affects their nutritional status. It determines what is eaten, where it should be eaten, access to health care system and even how much money a child is given for school.

2. 4.2.1 Socioeconomic status

Nutritional status of children does reflect the socioeconomic status of the family and social wellbeing of the community on a whole (Srivastava et al., 2012). The surrounding environment which is sometimes influenced by socioeconomic status also affects the nutritional status of SAC (Srivastava et al., 2012). Research has shown that socio-economic status of caregivers affect the nutritional status of SAC. Malnutrition among children is directly or indirectly caused by mother's educational and social status, food availability and access to safe water, these are indicators of socioeconomic status (Smith and Haddad, 2000).

Srivastava et al., (2012), reported that mothers' educational status was a strong predictor of child nutritional status. Among Korean SAC, Song et al., (2011) found that SAC with higher educated mothers were less likely to be anaemic (odds ratio=0.52; 95%CI=0.32-0.85; p=0.032). Among Iranian SAC, mothers and fathers without formal education have been reported to have more stunted children (p<0.05; Malekzadeh et al., 2003).

It has also been established that there is an inverse relationship between household income and nutritional status (Al-Mekhlafi et al., 2008). In a study among Nairobi SAC,

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Chesire et al., (2008) found that household with low incomes have more stunted children than those with higher incomes (p=0.025). Household monthly income is significant when it comes to access to food, health care and housing facility. It has been reported that SAC living in poor quality houses such as non-permanent rooms were more likely to be undernourished (Ndukwu et al., 2013).

Also, Malekzadeh et al., (2003) found a significant relationship between caregivers occupation and stunting among rural Iranian SAC ($p<0.05$). Unemployed fathers in this study had more stunted children than employed fathers (Malekzadeh et al., 2003). Another socio-economic factor that contributes to nutritional status is the household size. Mekonnen et al., (2013) found among 790 primary school children from rural Ethiopia that children from a family size of 6-8 were more likely to be stunted than those from family size of 2-5 members.

2. 4.2.2 Food Security and Hunger

Globally, it has been realised that hunger kills more people than diseases such as AIDS, malaria and tuberculosis combined each year (WFP, 2012). It is estimated that about 98% of these people live in developing countries where as many as 15% of the populace are undernourished. FAO (2012), reports that 870 million people worldwide do not get enough food to eat in a day. As many as 66 million primary school age children attend classes whiles hungry (WFP, 2009). Of these children a little over a third (23 million) of them are from Africa (WFP, 2012).

Studies have indicated that food insecurity is linked with lower dietary intakes among children and the other populace; others have reported the reverse (Potamites and Gordon, 2010). However, according to Nord and Hopwood (2007), children are least susceptible to food insecurity. This is so because food insecured households with children shield their younger

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children from the effect of the family's food insecurity. In a review of studies on nutrition and school performance by Taras (2005), he reported that food insufficiency was enough to lead to changes in height and weight ratios.

2. 4.3 Diseases and Infections

Globally, helminth infections affect more than 1 billion people in developing regions (Diseases Control Priorities Project, 2008). Of these people, school age children and preschoolers are more infected than any other age group (Hotez et al., 2008). School-age children have been reported to have the highest intensity of worm infection of any age group (Disease Control Priority Project, 2008). Among SAC, helminth infections occur as a result of poor hygienic habits, immune system and overcrowding (Alemu et al., 2011).

In children, worm infections are detrimental to their physical growth and educational advancement (Disease Control Priority Project, 2008). Worm infections among SAC also affect their survival, appetite, physical fitness and school attendance and performance (Alemu et al., 2011). There is evidence to suggest that deworming leads to improved appetite (Crompton and Neishem, 2002). In a study of the effect of helminth infections treatment on children, Hadju et al., (1996) found that treating school boys within 3 and 6 weeks leads to an increase in their appetite. A further treatment of Indonesian SAC boys in 6 months for helminth infection led to other improvement in their health status such as improved growth and physical activity than their untreated fellows (Hadju et al., 1998).

Reduced appetite will make a child unable to eat well. Once child has a reduced food intake, it is likely to result in inadequate intake of micronutrient (Crompton and Neishem, 2002). This in the long run will lead to micronutrient deficiency. According to Crompton and Neisham,

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(2002), helminth infections are likely to make school age children take less energy, have a reduced lactase activity and absorption of fat and Vitamin A and its precursors.

In children, consequences from helminth infections can also cause anaemia (Crompton and Neisham, 2002). Severe anaemia that is caused as a result of worm infections usually result in undernutrition, disability as well as pain among children (Disease Control Priority Project, 2008). Helminth infections lead to iron loss from blood in intestine and also reduced intake of iron rich foods as a result of reduced appetite (Crompton and Neisham, 2002).

Diseases such as Malaria, Diarrhoea and all other ailments that affect school children can also affect their nutritional status. Diseases have the tendency of increasing nutrient needs of children. In cases like diarrhoea and vomiting, the loss of fluid is accompanied by loss of micronutrients and thus children nutrient needs increases.

2.5 Interventions and Programmes for improving Health and Nutritional Status of SAC

During the school age period, interventions can also be targeted at children to help them catch up with growth and reduce residual effect of malnourishment that may have occurred during the preschool age (Partnership for Child Development, 2002). The school system has been a good platform in the delivery of activities that are channelled at improving the health and nutritional status of school children.

2. 5.1 Deworming

Deworming as an intervention for school children was called on by the World Health Assembly in 2001 (Disease Control Priority Project, 2008). Prior to this, the London-based Partnership for Child Development (PCD) evaluated deworming at schools in Ghana and Tanzania (Disease Control Priority Project, 2008). It was realised that the process improve the education and health of children, was efficient and cost effective as well as did not require any special training and

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infrastructure system (Disease Control Priority Project, 2008). In Indonesia, deworming of school boys yielded an increase in appetite, mid-arm circumference and height (Hadju et al., 1998).

WHO recommends that in highly endemic areas of infections; deworming should be done twice a year and in less endemic: once a year. Among 319 school children in Ethiopia, it was found that Soil transmitted helminth and *Schistosomamasoni* prevalence was high (82.4%) despite periodic school based de-worming (Alemu et al., 2011).

2. 5.2 Health and Nutrition Education

As a component of FRESH, (Focusing Resources on Effective School Health), nutrition and health education enhances school children as well as parents in the long term awareness of health and nutrition issues. Nutrition education enhances children knowledge of nutrition, healthy diet and physical activity (WHO, 2012).

2. 5.3 School Feeding Programmes (SFP)

Poverty, hunger as well as socio-cultural norms and supply constrains mitigate progress towards achieving primary education for all by 2015, MDG 2 (Thappa et al., 2009). School meals provide a direct way of addressing child nutrition and health issues (World Food Programme, 2013).

School feeding programmes (SFP) are practised by both industrialised and developing countries (Ahmed, 2004). In countries like the US, the national school lunch and breakfast schemes have been in existence for decades now. Also, UK and Canada have school meals scheme.

School feeding programmes may involve the provision of a school meal, a snack or take home ration. The school meal could either be at morning, mid-morning or lunch time. In

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Bangladesh, SFP provides a mid-morning snack to school children (Ahmed, 2004). The snack consists of eight fortified wheat biscuits. The take home ration has been practiced in many developing countries with a primary focus on girls. Burkina Faso is one of such countries and the northern regions of Ghana. In Egypt besides providing a snack at school to children, they also receive take home rations for their families (WFP, 2009).

Primarily, SFP seeks to mitigate hunger among school children by providing a nutritious meal whiles in the long term reducing poverty (WFP, 2013). The World Food programme has been very instrumental in organising SFP especially in developing countries to feed the 660 million school children who go to school hungry in each day (WFP, 2009).

2.5.3.1 Ghana School Feeding Programme

In Ghana, School feeding programmes have been instituted as one of the measures driven at achieving the MDG 2 of achieving universal primary education for all by 2015. Other measures taken by the government to enhance achieving universal primary education include "Capitation Grant (School Fee Abolition), expansion of Early Childhood Development services and promotion of measures to improve Gender Parity in primary schools" (Adamu- Issah et al., 2007). These measures have resulted in increase in enrolment rates, gender parity index as well as admission rates among school children in Ghana (Adamu-Issah et al., 2007).

The World Food Programme and Catholic Relief Services have supported feeding programmes that target only girls. In the Upper East and Upper West Regions in Ghana, this feeding initiative resulted in an increase in female enrolment figures by 31.4% and 26.1% respectively compared to the national average of 12.8% (SNV, 2008).

The Ghana School Feeding Programme (GSFP) was initiated in 2005 under the NEPAD "Home Grown " SFP concept. The goal of the GSFP was to use locally produced food to feed

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children in order to reduce poverty and malnutrition by providing a hot meal to public primary and kindergarten children. Whereas Bangladesh, SFP target chronically food insecured areas (Ahmed, 2004), Ghana SFP targets deprived areas (Buhl, 2010). As at 2009, the GSFP had contributed 20-25% increase in enrolment and 90-95% increase in school attendance and retention since its inception (GSFP, 2010).

2.5.3.2 Impact of SFP

SFP have an impact on the general wellbeing of school children and their health status. There exist a body of evidence that suggests that school feeding leads to better educational outcomes such as school attendance, enrolment and cognitive performance (Thappa et al., 2009).

2.5.3.2.1 Total dietary and nutrient intake

School feeding leads to an increase in dietary and nutrient intake of school children. This effect is clearly manifested in areas where caregivers do not reduce children's intake at home as a result of children's participation in a school meal program. An evaluation of the impact of the Bangladesh SFP reported that even poor household were not replacing the snacks children ate at school with home foods (Ahmed, 2004). This may be a result of the snack provided and not a meal.

SFP meals can increase dietary intake of children by 30 to 95% (Ahmed, 2004). It can also increase nutrient intakes. Among 320 Kenyan primary pupils, it was observed that participants had a higher intake of energy (2089 ± 12.41 kcal vs. 1841 ± 15.68 kcal) and protein than non-participants (Musamali, 2007). In Ghana, Martens (2007) observed that GSFP increased the dietary diversity scores (DDS) of the participating children by 1.0 ± 0.8.

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2.5.3.2.2 Nutritional Status

Although earlier malnutrition cannot be reversed by school Feeding (Bundy et al., 2009 and Kristjanson et al., 2007), there is evidence to suggest that meals provided in school improve nutritional status. Whiles evaluating the impact of school feeding on nutritional status of school children, it was reported that Body Mass Index increased by 0.62points of participants than controls (Ahmed, 2004). A study among Kenyan primary 5 and 6 pupils in schools with or without SFP, revealed that participants were less likely to be undernourished (8.1% BAZ scores of participants verses 16.3% of non-participants and 30% stunted participants against 53.1% of non-participants (Musamali et al., 2007). However in Ghana, unlike the Kenya study (Musamali et al., 2007), a study in Ashanti Region revealed that participating in SFP did not contribute to nutritional status of participants (Danquah et al., 2012).

The impact of SFP is not only macronutrients but also micronutrients. Micronutrient deficiency can be reversed rapidly if SFP targets it (Buhl, 2010). Children who have been supplemented with vitamin C rich foods and other micronutrient dense foods have been reported to have an increase in these micronutrients after some time.

2. 5.3.2.3 School performance

Performance of children at school is affected by a number of factors. These factors include quality of the school, family characteristics of the child such as socioeconomic status and parents' educational level as well as child characteristics (Grantham-McGregor, 2005).

Dietary intake has also been found to affect academic performance. Food insufficiency leads to poor academic performance (Tarras, 2005). Inadequate energy intakes automatically lead to less energy to support not only growth in the school age child but also school performance (Crompton and Neisham, 2002). Poor health and nutritional status caused as a result of inadequate dietary intake may reduce a child's ability to learn (Abudayya et al., 2011).

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In the systematic review of SFP's, Kristjansson, (2007), stated that hunger affects attention and interest. This may account for the inability of the child to learn. Children who are chronically undernourished are irritable and have a reduced attention span (Abudayya et al., 2011). These can affect their ability to learn well (Abudayya et al., 2011) and subsequently lead to poor academic performance.

In a study by Florence at al., (2008) in Canada, they found that children who take adequate amounts of fruits and vegetables perform better in school than their colleagues who do not. In a study among Palestinian adolescents aged between 12 and 19years, fruit and vegetables intake was significantly associated with school performance (Abudayya et al., 2011). This association remained positively significant even after socio-demographic factors and nutritional status were adjusted for (Abudayya et al., 2011). In this study, stunting was negatively associated with school performance (Abudayya et al., 2011).

Intake of fruits and vegetables prevents the incidence of micronutrient deficiency as well as anaemia (Abudayya et al., 2011). Anaemic children have been reported to have poorer learning outcomes (Abudayya et al., 2011).

Children who have been supplemented with diet high in nutrient that they have deficiency in have had remarkable improvements in their academic performance. SFP offers the opportunity to increase dietary intakes of children whiles addressing nutrients of interest. As such school feeding programmes may not improve solely nutritional status but also educational outcomes (Buhl, 2010). Test scores of school children increased by 15.7 % after they participated in a school feeding programme in Bangladesh (Ahmed, 2004). Also these Bangladesh school children were found to perform very well in Mathematics (Ahmed, 2004). In a study in Burkina, significant association was observed between participating in SFP and mathematics performance of 5-15yr old girls (Kazianga et al., 2008).

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2.5.3.2.4 School attendance

There is well documented evidence to suggest that SFP improves school attendance. From Tarras (2005), review on studies on nutrition and school performance, he observed that studies on school breakfast and absenteeism have reported that children are most likely to attend school when there is a school breakfast program. This may be as a result of the fact that a child who is hungry may not attend school or classes regularly (Tanzania Food and Nutrition Center, 2006).

In Bangladesh for instance, school attendance increased by 1.3 a month only a year after the introduction of SFP (Ahmed, 2004). Also in Nairobi, a study by Chesire et al. (2008), found an association between stunting and school attendance. About 70% of stunted SAC were less likely to attend school as compared with 56% of non-stunted SAC (p=0.044). Surprisingly, it has been reported that those who were exposed to take home rations and school feeding meal had a higher rate of absenteeism than non-participants (Kazianga et al., 2008). The beneficiaries were significantly absent more days (0.7days verses 0.4days for non-participants).

2.6 Conceptual Framework

The frame work for this study is presented in Fig. 2.1. The frame work describes the possible linkage between dietary intake, nutritional status and school attendance and performance of SAC. From the framework, it can be seen that dietary intakes at home and outside the home influences the total dietary intakes of SAC. Out of home food can be modified by school feeding programme since it can supplement the quantity and nutrient quality of food that a child eats in a day. Dietary intakes from the home are also predicted by socioeconomic status and food security situation at the household level.

Also, it can be seen from Fig 2. 1that nutritional status of SAC is predicted by dietary intake and diseases as well as deworming status of SAC. The nutritional status of SAC has a potential effect on cognitive abilities, school attendance and performance. An undernourished

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SAC may therefore have lower school attendance and performance (Omwami et al., 2011 and Mukudi, 2003). Undernourishment leads to impaired learning abilities and also lesser motivation both socially and psychologically to attend school on a regular basis.

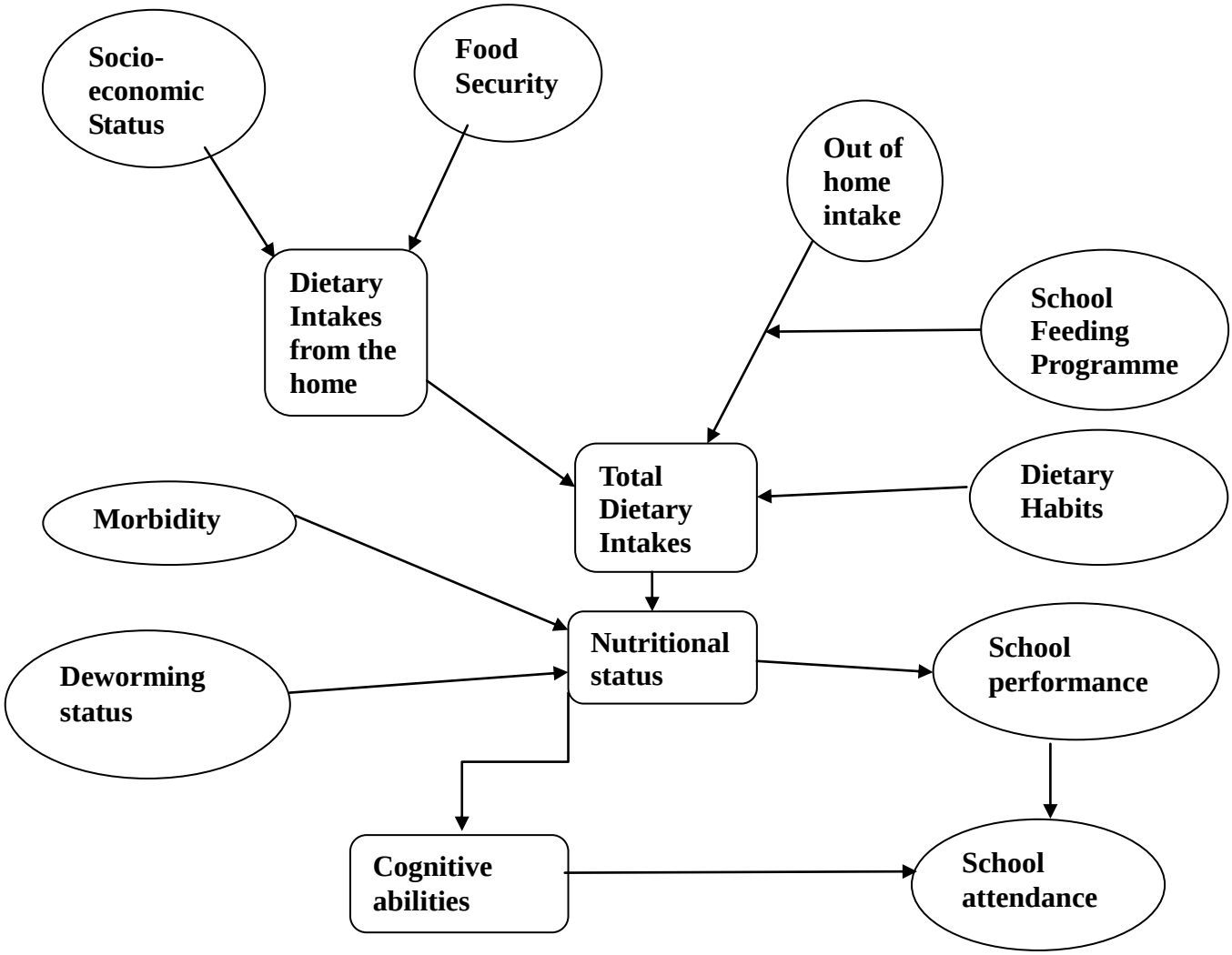


Fig 2.1: Relationship between diet, nutritional status and school attendance and performance of School Age Children (SAC).

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CHAPTER 3

3.0 METHODOLOGY

3.1 Study Site

The study was conducted in two neighbouring rural areas, Otinibi and Danfa located in the La Nkwatanang Madina Municipal area of the Greater Accra region. Study participants were school age children attending public schools in the two communities and their caregivers. The communities were purposively selected because they had similar geographic and socioeconomic characteristics and the presence of a government-based school feeding programme (SFP) in one community (Danfa) and an NGO (Food for People)-based school feeding programme in the other community (Otinibi) to facilitate comparison between the two types of SFP.

The public school at Otinibi, Otinibi Basic M/A had a population of 200 children and 6 teachers. School lessons began each day at 8: 30am and ended at 1:30pm. However, extra classes were organised each day for children in the upper classes (Class 4 to 6) and as such these children in class 4 to 6 close from school at 2pm on each school day. Danfa is an adjacent community to Otinibi which is about a mile (1.8 km) away (http://www.gomapper.com/travel/list-of-cities-near/danfa.html). Danfa Methodist Basic School had a population of about 330 children and 8 teachers. School lessons began each day at 8:30am and ended at 1:30pm. However, extra classes were organised for children on Mondays, Tuesdays and Thursdays so lessons ended at 3pm on these days.

Ghana School Feeding Programme (GSFP) was providing a mid-morning meal on school days to children at the Danfa Public school premises. The children who were served with GSFP meals were in kindergarten and primary 1 to 6. NSFP was providing either a mid-m orning meal

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or lunch to all the pupils (Kindergarteen to JHS 3) in the Otinibi Basic school at the NSFP canteen.

3.2 Description of NSFP and GSFP

Table 3.1 shows a brief description of NSFP and GSFP. The NSFP at Otinibi is managed by FFP (Food for the people). FFP (also referred to as Prembaf) is a Non Governmental Organization (NGO) which was inaugurated in May 2012. Primarily it seeks to provide individuals and households with the emergency and supplemental food they need, while working to address the root causes of hunger". In Ghana, Prembaf aims at providing a healthy meal in a day to school children whiles increasing school attendance and performance at the same time. The cost of meal per child is 70 pesewas.

The facility for the programme has staff strength of 15 and provides either a mid-morning meal or lunch for children during school days and Saturdays. The mid-morning meal is usually provided for the children in Kindergarten up to Primary 5. Also, children in the upper classes, Primary 6 to Junior High School (P6-JHS 3) are fed with the lunch. Usually the same meal is served in a day at both mid-morning (10am) and lunch (12pm). However, children who suffer from food allergies are served different meals other than the menu for the day. Also, the elderly and other poor people in the Otinibi community are also fed at the facility throughout the week.

The GSFP at Danfa is managed by the government of Ghana. Although GSFP was launched in 2005 in Ghana, it was started at the Danfa public school in January, 2012. The programme provides a mid-morning meal at a cost of 40pesewas per child. The programme has staff strength of 4 and feeds children in kindergarten up to Primary 6. Meals are served on a school block veranda and children select any place on the school compound such as under trees

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to eat the food. Children (class 1-6) who do not bring their own bowls are not fed with the SFP meal.

The menu plan for GSFP at Danfa can be observed in Appendix IVa. When the menu is compared with meals served within the 4 weeks period (Appendix IVb), it can be observed that beans and gari originally on the menu was never served. Informal discussion with the caterer in charge of GSFP at Danfa showed that seasonal variability was the main reason for not serving that meal. According to her palm oil was very expensive and will raise the cost of feeding per child more than the money the government has given her to cater for that purpose. However, the NSFP manageress said they don't have a fixed menu. Menu is prepared each week and takes into consideration seasonal availability of food.

Table 3.1: Description of School Feeding

	NSFP (Otinibi)	**GSFP (Danfa)**
Year of Establishment	May, 2012	January, 2012
Type of meal	Mid morning/Lunch	Mid morning
Cost of meal/child	70 pesewas	40pesewas
Place meals are served	On school block veranda	Canteen
Location for eating meals	Under trees or any other convenient place for child	Canteen
Type of Bowls	Standardised bowls provided	Each child brings his/her bowl except for kindergarten children who are provided with bowls

3.3 Study Design

A cross sectional design involving a one point time data collection of school aged children (SAC) was used for the study.

3.4 Study Population

The study involved Class 1-6 pupils attending public school in the study communities (Danfa and Otinibi) and their caregivers. The inclusion criteria for participation were:

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1. Child aged 6 to12years old.
2. Willingness of the child and their caregiver to participate in the study by signing an informed consent form.
3. Child should have been enrolled in the school for at least one term prior to the start of the study.

3.5 Sample Size

Based on classroom registers there were 300 and 125 potentially eligible SAC (i.e those in class 1 to 6) at the public schools at Danfa and Otinibi, respectively. Given that resources for the study were limited, we elected to enrol 100 SAC from each school. It was estimated that with this sample size, there was enough power to detect a difference of energy: 200 kcal (Power =89%), protein: 5 g (Power =79%), iron: 2 mg (Power =65%), Vitamin C: 12 mg (Power = 68%) and zinc: 1 mg (Power = 91%) between the intakes of SAC from the two schools. Standard deviations of the present study's mean energy and nutrient intakes were used to calculate the statistical power.

3.6 Sample Recruitment

A total of 232 (112 from Otinibi and 120 from Danfa) parents responded positively to permission slips sent out. Out of the total positive responses, 214 caregiver and child pairs were interviewed completely. 18 children were discovered to be ineligible due to their age and also no available data on their academic performance in the past term. A total of 214 school age children/caregiver pair participated in the study. 100 children were from the Otinibi Basic School and 114 from Danfa.

It was assumed at the point of enrolment into the study, that all the SAC recruited were participating in the school feeding programme available to their respective school (either the

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Government sponsored school feeding programme (GSFP) or the NGO-sponsored one (NSFP), although this was not an established criteria for participation in the study. However, during data collection, several of the SAC revealed that they did not participate in the school feeding programme (SFP) at their school.

Due to time constraints it was not possible to recruit additional students to replace those identified as not receiving school meals and therefore a third arm of study participants (SAC not participating in school feeding program) was created. This third group were excluded from the final analysis. However, there were no statistical differences between socio-demographic characteristics of SAC who were not participating in SFP and those who were participating. Figure 3.1 depicts the sampling profile with sample sizes of SAC for each category of school feeding programme.

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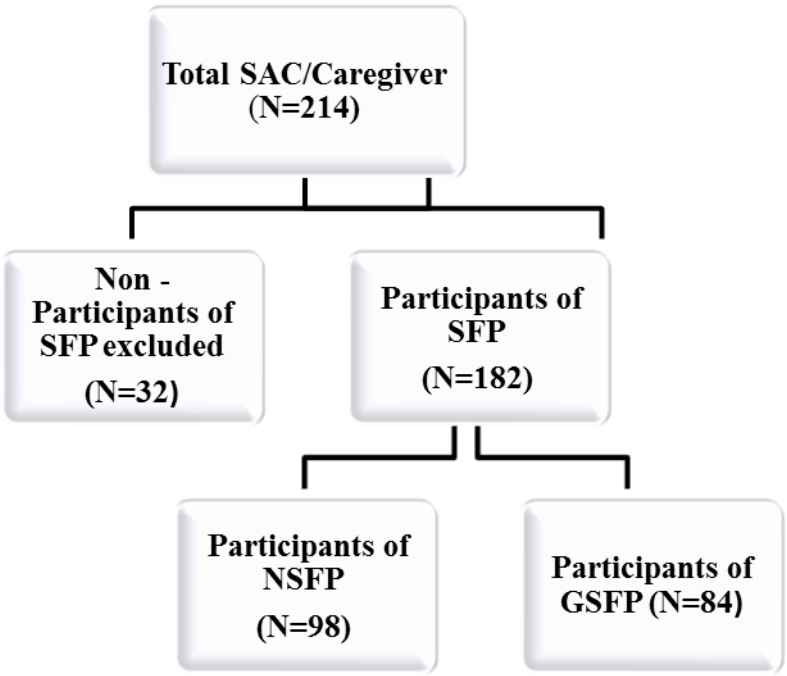


Fig 3.1: Sample size used for analysis

3.7 Data Collection Procedures

Data collection took place from January, 2013 till April 2013. The data collection involved questionnaire administration, dietary intake assessment, assessment of anthropometric measurements and assessment of haemoglobin levels. Additionally data abstraction from the class and academic performance registers of the SAC in the study were completed. All data were collected by the researcher and a trained field assistant.

3.8 Questionnaire Administration

Two structured questionnaire instruments were developed and pretested in a community (Kweiman), neighbouring the two study communities. One of the questionnaires was designed to solicit information from caregivers on personal characteristics, household characteristics, household food security and child morbidity and was administered via face-to-face interviews during home visits to caregivers of the SAC in the study. The second questionnaire was

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administered to the SAC during break times at school and solicited information on personal characteristics and dietary habits at school and home.

3.9 Dietary Intake

The 24-hour recall method was used to collect information on all foods (including school feeding meals) and beverages, except water, consumed by the SAC on two non-consecutive school days. Days where the children were absent from school as results of ill health or other reason or when, the feeding programme did not serve meals to any of the children were excluded from the recall days.

Detailed information on the cooking method, time of day, the source of the food and where the food was consumed were collected. In recalling foods consumed in the past 24-hours, the SAC were also asked to indicate the time of each eating event, the source of the food (whether, purchased, home-made, or school meal) and using household measures and wooden food models to estimate the actual quantity of food eaten. For foods that the children reported purchasing from food vendors within the school compound or the community, the cost of food was obtained and the same quantities purchased and weighed to get the quantities consumed by the children.

Also, foods fed to children by the feeding programmes were weighed throughout a week to estimate the average amount of food that children are fed within a week. For 3 younger children who could not estimate their food, caregivers or older siblings helped in estimating the actual quantity of foods eaten at home.

3.10 Anthropometry

Height and weight measurements were completed on the SAC in the study. The children's heights were taken to the nearest 0.1 cm using standard procedures (CDC, 2011) with a Tanita

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HR-200 stadiometer. The children were weighed to the nearest 0.1kg using standard procedures with a Tanita BWB 800 weighing scale (CDC, 2011). Height and weight measurements were taken in duplicates and the average recorded.

3.11 Assessment of haemoglobin levels

Haemoglobin levels of 51% of SAC were assessed. Selection of children was done randomly. However, 3 children who did not want to take part of the test were replaced. A few drops of blood was obtained from each child using the finger prick method by a professional phlebotomist. The haemoglobin levels of each participant in g/dl (gram per decilitre) were recorded on the field from the Hb 201^{+}Hemocue machine.

3.12 Data abstraction

School attendance information was abstracted from the school register in both schools. The information recorded was the total number of days that SAC were present in school out of the total number of days they were expected to be in school within the immediate past term. Also information on academic performance of SAC in the last term was abstracted from the School Based Assessment (SBA) records. Total percentage scores for score subjects such as Mathematics, English and Science were recorded.

3.13 Ethical Considerations

The research protocol was reviewed and approved by the Institutional Review Board (IRB) of the Noguchi Memorial Institute for Medical Research, Accra, Ghana. Permission to carry out the study at the schools was obtained from Ghana Education Service Directorate at Ga-East Municipal and the heads of the schools. Additionally, the La-Nkwatanang Municipal Directorate

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of the Ghana Health Service provided a letter of support to facilitate the haemoglobin assessments.

Parents of the SAC were verbally informed about the study at a Parent Teacher Association (PTA) meeting in each school. Parents who wanted their children to participate in the study gave their consent by returning a signed permission slip. All study participants signed an informed consent document prior to being interviewed.

3.14 Data Management and Analysis

The data were entered and managed using Statistical Package for Social Sciences (SPSS) version 16 computer software. Anthropometric data of weight and height were initially converted to Height for age Z scores (HAZ) and BMI for age Z scores (BAZ) using WHO Anthro Plus version 10.4. Haemoglobin levels of SAC were also converted into anaemia categories based on age specific standards set by WHO (WHO, 2011). Dietary data were also converted to energy and nutrients using the RIING Nutrient Database. Energy and nutrient composition of daily intake of SAC was compared to Dietary Reference Intakes (FAO, 2004d). Dietary diversity scores (DDS) were also calculated using the FAO guideline (FAO, 2011).

Descriptive statistics were used to summarise categorical and continuous variables. Some of the continuous variables were age of study participants and their caregivers, Household size, number of children in the household, number of times they eat food in a day, dietary diversity as well as energy and nutrient intakes which were summarised as means plus/minus standard deviation. Some of the categorical variables were sex, class, ethnicity, religion, and place of residence, relationship between caregiver and SAC, caregiver's and father's educational level and occupation, household income, household food security, types of food groups SAC

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ate, morbidity of SAC in the past 6months as well as nutritional status of SAC (Hb, BAZ and HAZ). These were summarised using frequencies and proportions.

Chi–square test and independent T-test was used to determine the differences in socio–demographic and household characteristics of caregivers of SAC and personal SAC characteristics of SAC who participate in GSFP at Otinibi and NSFP at Danfa. The Chi–square test was used for the differences in the categorical variables whereas the T–test was used for the continuous variables. Also to compare the contribution of NSFP and GSFP meals to intakes of SAC and total daily intakes of SAC, independent T-test was done.

To identify the determinants of nutritional status (BAZ, Hb and HAZ and having at least a nutritional deficit) among SAC, independent t-test and chi-square test were used to find the correlation between nutritional status (BMI and haemoglobin levels) and variables associated with nutritional status. In literature, variables such as maternal education status and occupation, socio-economic status, and dietary knowledge of the caregiver, household food security situation, dietary intakes, sex, age and morbidity of the index child influence the BAZ, HAZ and Hb of SAC. To assess the strength of association of the variables that relate with BAZ, HAZ, Hb and having at least a nutritional deficit, linear and logistic regression were done.

In the linear regression model, the outcome variables were Hb, BAZ and HAZ. The explanatory variables were socio-demographic and household characteristics such as sex, age, caregivers' educational level and occupation, household monthly income, household size, number of children and household food security, dietary intakes and morbidity of SAC. Dummy variables were created for each of the category of explanatory variables. The outcome variable for the logistic regression was SAC having at least a nutritional deficit. Explanatory variables were the same variables that were used in the linear regression model.

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To assess whether there is an association between the children's nutritional status and attendance and performance in core subjects in the past term, independent t-test was done to assess the differences in school attendance and performance among nutritional status of SAC. Level of statistical significance was set at $p < 0.05$ for all the analysis.

3.15 Quality Assurance

To ensure validity and reliability of data collected, a research assistant was trained in 5 days to administer the questionnaire and to conduct anthropometry in a standardised manner. The weighing scale was also calibrated with a standard weight daily.

Each day after data collection, questionnaires were reviewed to ensure accuracy. Where responses were missing, illegible or ambiguous, respondents were contacted by a follow up visit or phone call to clarify responses.

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CHAPTER 4

4.0 RESULTS

4.1 Sociodemographic and Household Characteristics of School Age Children (SAC) and their caregivers in the study

The sociodemographic and household characteristics of caregivers of the SAC in the study are summarized in Table 4.1. The mean age of caregivers of the SAC was 41 ± 11years and most of them were the children's biological parents (68.1%). The majority were either Ga/Ga-Adangme or Ewe ethnicity (61.6%) and more than 60% of them had completed at least junior secondary or middle school. Caregivers were mainly traders (62.6%) by profession and the majority were married. Overall, the most common economic activity of the caregiver' spouses was vocational occupations.

A majority (70.2%) of caregivers reported a household income of 500 Ghana cedis or less. The average household size was 6 ± 2 members comprising of a mean of 3 ± 1 adults and 4 ± 2 children (<18yrs). Caregivers of SAC in the GSFP and NSFP had similar sociodemographic characteristics except that the majority (76.5%) of spouses of caregivers of the SAC in the GSFP were in vocational employment whereas less than 50% of spouses of caregivers of the NSFP children were engaged in vocational employment (p=0.002).

The mean age of the SAC was 10 ± 2years and the majority were in class one to three (Table 4.2). About 55% of the children were female and Christianity was the most common religion among them. A little over 50% of the children lived in the same community where the school was located and lived with both parents. The majority of the children received money for school from their parents; those who were given money on

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average received just less than 1 Ghana cedis daily. There were no significant differences in the background characteristics of the SAC in the GSFP and the SAC in the NSFP.

Table 4. 1: Socio-demographic and Household characteristics of caregivers of Participants Government School Feeding Programme (GSFP) and NGO School Feeding Programme (NSFP)

Characteristics	Total (N=182)	NSFP (N=98)	GSFP (N=84)	P-value[1]
Age (yrs)	41 ± 11[2]	40 ± 12	42 ± 11	0.331
Relationship to child				
Biological parent	124 (68.1)[3]	70 (71.4)	54 (64.3)	0.303
Other relative[4]	58 (31.9)	28 (28.6)	30 (35.7)	
Ethnicity				
Ga /Ga– Adangme	56 (30.8)	32 (32.7)	24 (28.5)	0.313
Ewe	56 (30.8)	34 (34.7)	22 (26.2)	
Akan	40 (22.0)	17 (17.3)	23 (27.4)	
Northern ethnicity	30 (16.5)	15 (15.3)	15 (17.9)	
Formal education completed				
≤Primary	79 (43.4)	43 (43.9)	36 (42.9)	0.551
JHS/Middle school	80 (44.0)	45 (45.9)	35 (41.7)	
>JHS	23 (12.6)	10 (10.2)	13 (15.5)	
Occupation				
Trader	114 (62.6)	62 (63.3)	52 (61.9)	0.525
Vocational Occupation	19 (10.4)	8 (8.2)	11 (13.1)	
None	15 (8.3)	7 (7.1)	8 (9.5)	
Other[5]	34 (18.7)	21 (21.4)	13 (15.5)	
Marital status				
Married	148 (81.3)	82 (83.7)	66 (78.6)	0.379
Single /Divorced/Widowed	34 (18.7)	16 (16.3)	18 (21.4)	
Spouse's education level*				
≤Primary	36 (23.7)	21 (25.0)	15 (22.1)	0.165
JHS/Middle school	75 (49.3)	36 (42.9)	39 (57.3)	
> JHS/Middle school	41 (27.0)	27 (32.1)	14 (20.6)	
Spouse's occupation				
Vocational	91(59.9)	39 (46.4)	52 (76.5)	**0.002**
Professional	18 (11.8)	13 (15.3)	5 (7.4)	
None	4 (2.6)	2 (2.4)	2 (2.9)	
Other[6]	39 (35.7)	32 (37.6)	9 (13.2)	
Monthly household income				
≤GH ¢500	127 (70.2)	63 (64.9)	64 (76.2)	0.099
>GH ¢500	54 (29.8)	34 (35.1)	20 (23.8)	
Household size	6 ± 2	6 ± 2	6 ± 2	0.390
No. of adults	3 ± 1	3 ± 1	3 ± 1	0.969
No. of children(<18yrs)	4 ± 2	4 ± 2	4 ± 2	0.649

[1]significance associated with independent t-test for continuous variables and chi square test for categorical variables; [2] Mean ± SD; [3] % (N);[4]Other relatives include aunts, uncles, siblings, grandparents, step parents and non-relatives; [5] Other includes stone winnower, farmer and professional workers; [6]Other includes maintenance/security workers, stone winnower, trader, pensioner, susu collector and farmer

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Table 4.2: Background characteristics of school age children participating in NSFP and GSFP

Characteristics	Total (N=182)	NSFP (N=98)	GSFP (N=84)	P-value[1]
Age (yrs)	10 ± 2[3]	10 ± 2	10 ± 2	0.888
Class				
1 to 3	112 (61.5)[2]	57 (58.2)	55 (65.5)	0.312
4 to 6	70 (38.5)	41 (41.8)	29 (34.5)	
Sex				
Female	100 (54.9)	51 (52.0)	49 (58.3)	0.395
Male	82 (45.1)	47 (48.0)	35 (41.7)	
Religion				
Christian	163 (89.6)	87 (88.8)	76 (90.5)	0.708
Islam	19 (10.4)	11 (11.2)	8 (9.5)	
Residence				
Within School's Community	99 (54.4)	50 (51.0)	49 (58.3)	0.323
Outside School's Community	83 (45.6)	48 (49.0)	35 (41.7)	
Lives with				
Both parents	98 (53.8)	55 (56.1)	43 (51.2)	0.456
Single parent	34 (18.7)	16 (16.3)	18 (21.4)	
Other relatives[4]	50 (27.5)	27 (27.5)	23 (27.4)	
Received money for school				
No	30 (16.5)	14 (14.3)	16 (19.0)	0.388
Yes	152 (83.5)	84 (85.7)	68 (81.0)	
Money received for food on school days (GH ¢**)**	0.80 ± 0.36	0.79 ± 0.31	0.70 ± 0.31	0.081

[1]significance based on independent sample t-test for continuous variables and chi square test for categorical variables; [2] % (N); [3] Mean ± SD; [4]Other relatives include aunts, uncles, siblings, grandparents and non-relatives;GSFPis Government School Feeding Programme (GSFP) and NSFP is NGO School Feeding Programme

4.2 Dietary habits of SAC

The eating habits of SAC on school days are summarized in Table 4.3. During school days the children ate an average of 4 ± 1 (inclusive of meals and snacks) a day. More than one- half (56 ± 16%) of the children's eating events on school days were consumed at

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home. An average of 50.3 ± 18% of the children's eating events on school days was home prepared and 25 ± 4% was a meal from the SFP.

Figure 4.1 shows the type of food groups consumed in 24 hours (based on 2 days 24hour recall). Nearly all the SAC had consumed grains, roots and tubers, fish and meat and other fruits and vegetables besides dark green vegetables over the two days of recall. Less than 20% of the children consumed dark green vegetables and organ meat was the least consumed food group. The mean dietary diversity score for SAC diet was 5 ± 1. More than half (52.8%) of SAC were found to have lower dietary diversity score (≤50th percentile).

Table 4.3: Dietary habits of SAC on school days

Characteristics	Mean ± SD
Frequency of eating events	4 ± 1
Location for eating events (%)	
Home	56 ± 16
School	38 ± 13
Food vendor's place	6 ± 13
Source of food (%)	
Home prepared	50.3 ± 18
School feeding programme	25 ± 4
Street food	18 ± 20
School compound vendor	8 ± 12

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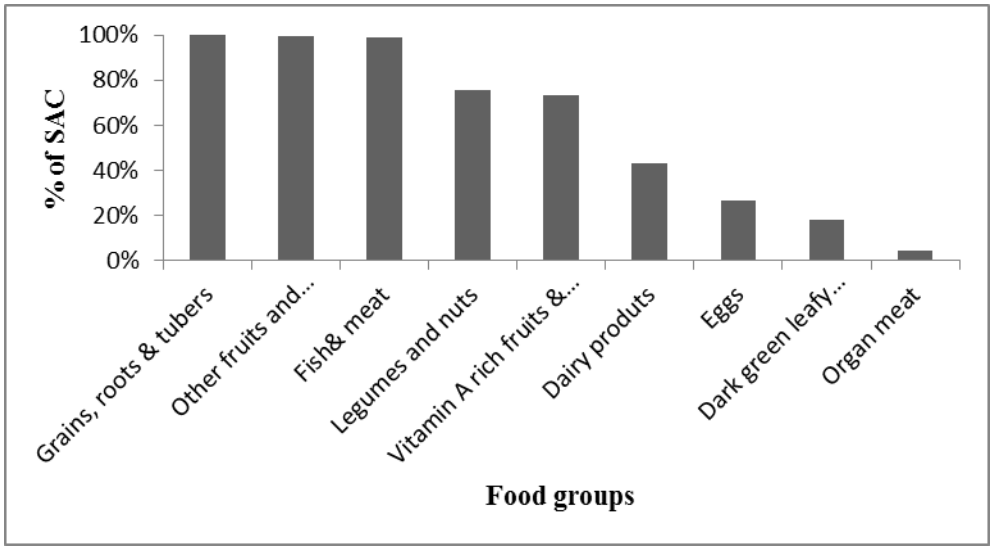


Fig 4.1: Food groups consumed by SAC in the past 24 Hours (2 day 24 Hour recall)

4.3 Energy and Nutrient Intakes of SAC and Contribution of SFP meals to their total intakes

4.3.1. Nutrient Content of Meals served by NSFP and GSFP

Menu served over a five-day observation period of the NSFP and GSFP is provided in Table 4.4. The energy and nutrient contents of weighed samples of food to children in the GSFP and the NSFP are summarized in Tables 4.5 and 4.6. The portion size of the GSFP served to SAC was lower than that of the NSFP (p=0.012).

Whereas the sampled weighed portions of food served to SAC in the NSFP met WFP recommendations for the energy and macronutrient content of school meals, the meals consumed by children in the GSFP during the observation period did not meet the recommendation for the energy and macronutrient content of school meals (Table 4.5). There were no significant differences between micronutrient contents of NSFP and GSFP (Table 4.6).

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Table 4.4: 5-day menu of school meals of GSFP and NSFP use for Nutrient Analysis

Day	GSFP	NSFP
Monday	Rice and Tomato stew	Rice, tomato stew and egg
Tuesday	Waakye and Tomato stew	Rice, tomato stew and sausage
Wednesday	Jollof with anchovies	Banku, light soup and chicken
Thursday	Banku Okro Soup with anchovies	Yam, cabbage stew with Tuna
Friday	Jollof and anchovies	Gari Eba, light soup and chicken

Table 4.5: Energy and Macronutrient content of GSFP and NSFP meals compared to WFP recommendations

	GSFP	NSFP	WFP
Portion size (g)	243 ± 50[2]	416 ± 96	
Energy (kcal)	315 ± 24	776 ± 427	600 - 900
Protein (g)	8 ± 2	20 ± 14	16 - 24
Fats (g)	6 ± 2	17 ± 8	7 - 11

[1] **significance based on independent t-test ;** [2] **Mean ± SD**

Table 4.6: Micronutrient content of meals served by the GSFP and the NSFP

	GSFP	NSFP	P-Value
Iron (mg)	4 ± 2[2]	5 ± 2	0.717
Zinc (mg)	1.3 ± 0.5	3 ± 2	0.158
Calcium (mg)	40 ± 20	69 ±56	0.309
Vitamin A (IU)	33 ± 17	54 ± 37	0.291
Vitamin C (mg)	9 ± 1	20 ± 16	0.155

[1] **significance based on independent t-test;** [2]**Mean ± SD**

4.3.2 Dietary Intakes of SAC (based on 2 day-24hour recall)

The total intakes of SAC in the NSFP contained more energy, protein and zinc than that of children in the GSFP (Table 4.7). Amounts of other micronutrients consumed were similar for the two groups. Table 4.8 shows the total energy and nutrient intakes of the SAC as percent of recommended daily intakes for SAC. Based on the 2-day 24-hour recall, the total dietary intakes of the SAC participating in the two types of SFP exceeded

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the DRI for most of the nutrients assessed. Children in both programmes only met about 30% of the DRI for calcium. Although the DRI for energy and protein were met or exceeded by both groups of SAC, those in the NSFP on average met or exceeded the DRI by a larger margin (p<0.001).

Table 4.7: Daily total intakes of energy and selected nutrients of Participants of NSFP and GSFP (2-day 24 hour recall)

	Total (N=180)	NSFP (N=97)	GSFP (N=83)	P-value[1]
Energy (kcal)	2217 ± 660[2]	2413 ± 626	1988 ± 627	**<0.001**
Protein (g)	58 ± 19	63 ± 17	53 ± 19	**<0.001**
Fats (g)	53 ± 30	55 ± 26	50 ± 36	0.302
Iron (mg)	25 ± 8	25 ± 7	25 ± 10	0.617
Zinc (mg)	9 ± 3	10 ± 3	9 ± 3	**0.004**
Calcium (mg)	384 ± 173	389 ± 162	378 ± 186	0.687
Vitamin A (IU)	947 ± 1230	977 ± 1035	912 ± 1430	0.723
Vitamin C (mg)	87 ± 50	93 ± 49	81 ± 50	0.106

[1] **significance based on independent t-test**
[2] **Mean ± SD**

Table 4.8: Total daily (based on 2-day 24 hour recall) energy and micronutrient intakes of SAC as percent of Dietary Reference Intakes (DRI) by type of school feeding programme

	Total (N=180)	NSFP (N=97)	GSFP (N=83)	P-value[1]
Energy	111 ± 33[2]	110 ± 33	99 ± 31	**<0.001**
Protein	146 ± 47	158 ± 44	132 ± 48	**<0.001**
Iron	296 ± 105	292 ± 86	301 ± 120	0.558
Zinc	132 ± 48	141 ± 42	123 ± 53	**0.011**
Calcium	34 ± 16	34 ± 14	33 ± 17	0.578
Vitamin A	176 ± 222	184 ± 194	168 ± 250	0.631
Vitamin C	234 ± 165	254 ± 167	210 ± 160	0.080

[1] **significance based on independent sample t-test;**[2] **Mean %± SD**

4.3.3 Energy and Nutrient Content of SFP and its Contributions to Total Daily Intakes

Whereas the GSFP meals consumed by SAC contributed from 12% up to 18.1% of the total energy and nutrient intakes of the children, the NSFP meals contributed from 17%

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up to 30% of the total energy and nutrient intakes of the children. With the exception of iron, where the contribution from meals by both types of programmes was similar, meals provided through the NSFP contributed significantly more energy (28 ± 10% vs. 16.2 ± 7%; p=<0.001), protein (24.6 ± 9% vs. 13.3 ± 7%; p=<0.001) and micronutrients (p≤0.042) to the children's total energy intakes compared to meals provided through the GSFP.

Table 4.9: Mean percent contribution of school meals to the total daily energy and nutrients of SAC by type school feeding programme

	GSFP (N=83)	NSFP (N=97)	P-value[1]
Energy	16.2 ± 7[2]	28.0 ± 10	**<0.001**
Protein	13.3 ± 7	24.6 ± 9	**<0.001**
Fats	13.3 ± 11	22.3 ± 12	**<0.001**
Iron	18.1 ± 10	20.3 ± 8	0.109
Zinc	15.7 ± 8	26.3 ± 10	**<0.001**
Calcium	12.5 ± 9	22.4 ± 11	**<0.001**
Vitamin A	12.6 ± 14	17.4 ± 18	**0.042**
Vitamin C	16.1 ± 13	30.2 ± 18	**<0.001**

[1] significance based on independent T-test; [2] Mean % ± SD

4.4 Nutritional Status of SAC

About 28% of the SAC had low haemoglobin levels indicative of anaemia (Figure 4.2). Approximately 48% of the children were stunted and 35% had low BMI for age or were thin and a very few (1.1%) were overweight. Cumulatively, 67% of the SAC in the study had at least one nutritional deficit of either anaemia, stunting, or thinness.

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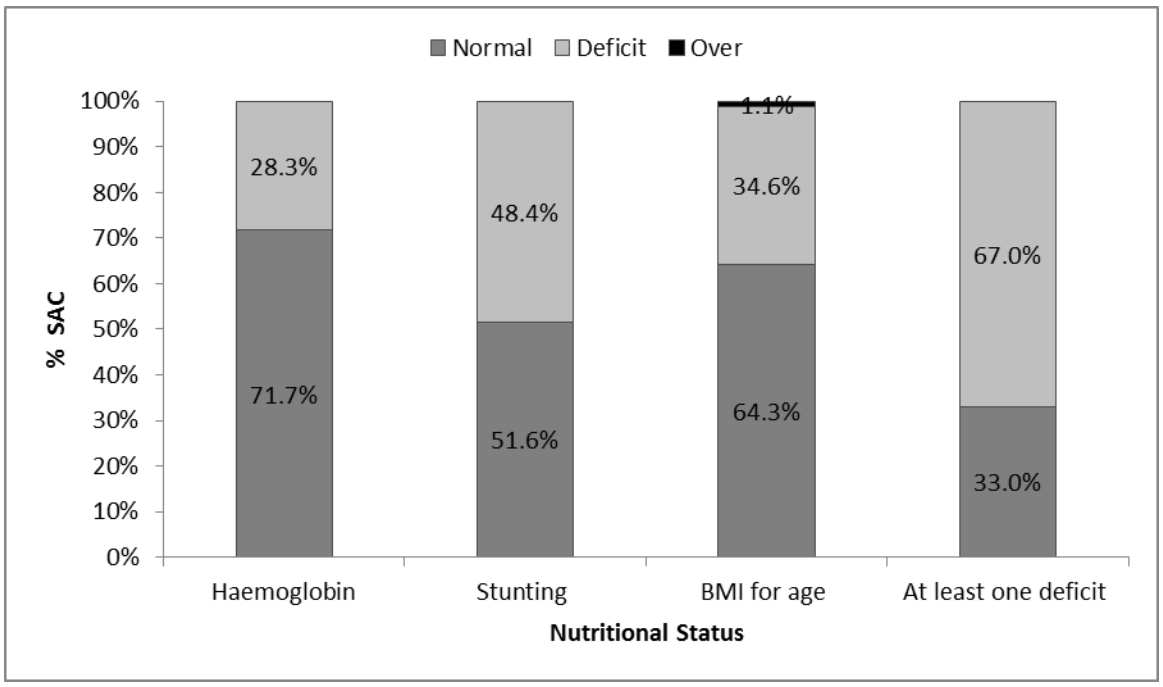


Fig 4.2: Prevalence of Anaemia, Stunting and Thinness and proportions of SAC with at least one form of undernourishment

4.5 Regression analysis for factors that predicted nutritional status of SAC.

Linear regression models for factors predicting nutritional status of the SAC are represented in Table 4.10 to Table 4.12. Most of the socio-demographic characteristics, child's health care in the past 6 months and dietary intakes were not significantly associated with haemoglobin level, Height for age and BMI for age of SAC. However, caregivers' educational level lower than JHS (β=-1.050; p=0.002) and SAC receiving a micronutrient supplement in the past 6 months (β=-0.900; p=0.009) were negatively associated with haemoglobin levels of SAC (Table 4.10).

Age of the SAC predicted significantly BMI for age (Table 4.11). There was a positive relationship between younger age (<10yrs) and BMI for age (β=0.342, p=0.010). Also, there was no relation between BMI for age (BAZ) and the energy intake of SAC (p=0.046).

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Age of SAC as well the occupation and educational level of their caregivers were significantly associated with Height for age, HAZ (Table 4.12). Younger SAC (<10yrs) was associated with higher HAZ (0.0382; 0.011). Similarly, HAZ was positively associated with caregivers' educational level higher than JHS (β=0.469; p=0.048). Another significant positive association was observed between unemployed, vocational occupation workers and trading occupations of caregivers and HAZ of SAC (p ≤0.021). Energy intake of SAC was significantly not related to their HAZ (p=0.005).

The incidence of having at least one nutritional deficit was not significantly predicted by dietary intake, health care variables and socio-demographic characteristics except the age of SAC and occupation of caregiver (Table 4.13). SAC who were younger (≤10yrs) were 0.489 times less likely to have at least one nutritional deficit than older (>10yrs) SAC. (CI=0.243-0.969; p=0.040). Caregivers who were engaged in other occupation such as farming, stone winnower and professional workers were 3.5 times more likely to have SAC with at least one nutritional deficit than traders (p=0.039).

Table 4.10: Linear regression of socio-demographic characteristics, dietary and health related variables associated with Haemoglobin level of SAC

	B	**SE**	**P-Value**	**R^2**
Caregiver education <JHS	-1.050	0.328	**0.002**	0.129
Household size >JHS	0.395	0.328	0.232	
Energy (kcal)	0.000	0.000	0.199	
Child never fell ill in the past 6 months	-0.501	0.329	0.131	
Child received micronutrient supplementation in the past 6 months	-0.900	0.340	**0.009**	

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Table 4.11: Linear regression of socio-demographic characteristics and dietary health related variables associated with BMI for Age of SAC

	B	SE	P-Value	R^2
Child age <10yrs	0.342	0.132	**0.010**	**0.057**
Caregiver education >JHS	-0.347	0.192	0.073	
No. of children in HH≤3	0.197	0.127	0.122	
Energy Intake (kcal)	0.000	0.000	**0.046**	

HH is household

Table 4.12: Linear regression of socio-demographic characteristics, dietary and health related variables associated withHeight for age

	B	SE	P-Value	R^2
Female child	0.271	0.144	0.061	0.111
Child age (<10yrs)	0.382	0.149	**0.011**	
Caregivereducation >JHS	0.469	0.236	**0.048**	
Caregiver occupation				
Unemployed	0.963	0.308	**0.002**	
Trader	0.612	0.207	**0.004**	
Vocational occupation	0.663	0.283	**0.021**	
Energy Intake (kcal)	0.000	0.000	**0.005**	
Child received micronutrient supplement in the past 6 months	0.223	0.148	0.133	

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Table 4.13: Socio-demographic characteristics, dietary and health related variables associated with having any nutritional deficits among SAC

	N	Odds Ratio	95% Confidence Interval	P-value
Child's age				
<10yrs	64	0.485	0.243-0.969	**0.040**
≥10yrs (ref)	115	1.000		
Caregivers educational status				
<JHS	79	2.916	0.635-7.586	0.214
JHS	79	1.718	0.495-5.962	0.394
>JHS (ref)	21	1.000		
Caregiver occupation				
None	15	0.451	0.141-1.437	0.178
Other	32	3.499	1.065-11.491	**0.039**
Vocational Occupation	18	0.527	0.182-1.530	0.239
Trader (ref)	114	1.000		
Household size				
≤6	109	0.731	0.640-3.072	0.398
>6 (ref)	70	1.000		
Number of children in household				
≤3	80	1.402	0.336-1.590	0.429
>3 (ref)	99	1.000		
Energy (kcal)	180	1.000	0.999-1.000	0.251
Received Micronutrient Supplementation				
No	71	1.330	0.663-2.667	0.423
Yes (ref)	111	1.000		

4.6 Association between Nutritional status of SAC and School Attendance and Academic performance

There were no significant association between the current nutritional status of Haemoglobin level, Height for Age and their performance and attendance at school in the past term (Table 4.14). However, SAC with any nutritional deficit had lower scores in mathematics and English in the past them than better nourished children (children without nutritional deficit).

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Table 4.14: Association between current nutritional status (Hb, HAZ, BAZ) and mean percent of school attendance and performance in the past term

	Attendance		Mathematics		English		Science	
	(Mean % ± SD)	P-value[1]	(Mean % ± SD)	P-value	(Mean % ± SD)	P-value	(Mean % ± SD)	P-value
Haemoglobin (Hb)								
Normal	92 ± 12	0.617	66 ± 14	0.377	68 ± 12	0.688	65 ± 11	0.376
Anaemic	91 ± 13		69 ± 16		67 ± 13		67 ± 11	
Height for age (HAZ)								
Normal	91 ± 14	0.967	69 ± 14	0.105	71 ± 13	0.173	67 ± 13	0.441
Stunted	91 ± 12		65 ± 14		68 ± 13		66 ± 12	
BMI for age (BAZ)								
Underweight	89 ±17	0.157	64 ± 15	0.117	69 ± 12	0.756	65 ± 12	0.410
Normal	92 ± 10		69 ± 13		70 ± 13		67 ± 13	
Overweight	86 ± 20		71 ± 7		75 ± 4		72 ± 6	
Overall Nutritional Status								
Normal	92 ± 13	0.418	70 ± 13	**0.037**	72 ± 12	**0.027**	68 ± 13	0.327
Having Any Nutritional Deficit	90 ± 13		65 ± 15		68 ± 13		66 ± 12	

[1]**significance based on ANOVA for BAZ and independent sample t-test for Hb, HAZ and Overall nutritional status**

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CHAPTER 5

5.0 DISCUSSION

5.1 Dietary Habits

The mean number of eating events (meals and snacks) was normal. According to FAO, the daily meals of school children should be composed of 3 meals and some snacks (FAO, 2004a). The number of eating events on school days was 4 ±1. This may have been as a result of the number of break times they have during school sections. Most SAC usually ate in the morning before classes started, during the two break sections at school, after school and in the evening. The number of meals that SAC ate is consistent with what Danquah et al., (2012), observed among participants and non-participants of GSFP who reported eating four times daily.

From the study, it was observed more than half of the meals that SAC ate on school days were at home. Consistent with this finding, Olusanya, (2010) found that a higher percentage of meals consumed by rural Nigerian primary1 to 3 pupils were at home (breakfast: 89.7%, lunch: 100% and supper: 100%). In this same study of Nigerian pupils, the source of meals was mostly home prepared (breakfast: 72.4% and 100% for both lunch and supper).

In this present study, more than 80% of SAC were given money for food on school days and the average amount of 70 pesewas that they received was equivalent to the cost of meals served by NSFP per child. The meals served by NSFP had enough nutrients to meet recommendations set by WFP for SFP meal. Thus it is not surprising

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that SAC in this study ate more non-home prepared food compared with the Nigerian pupils whose major source of meals were home prepared.

Consistent with typical African diets, all SAC interviewed reported eating food belonging to grains, roots and tubers groups. Food groups that were less consumed by SAC included organ meats, dairy products, eggs and dark green leafy vegetables. Olumakaiye, (2013) also found a similar results among 600 SAC at South Western Nigeria. SAC involved in the study were less likely to consume food groups such as organ meats, milk and milk products, eggs, and vitamin A rich fruits and vegetables (Olumakaiye, 2013).

It has been well documented that children are less likely to eat fruits and vegetables as part of their diet. An example is a study in Nigeria, that found that only <5% of the SAC interviewed ate fruits in the past 24hours (Ene-Obong and Ekweagwu, 2010). Contrary to this, this study found as many as 74% of SAC eating fruits in the past 48hours.

It is worth noting that the fruits that these children ate were mostly black berry (known locally as yooyi), dawadawa fruit and mango (saloo). Few of them ate banana, oranges and apple. The aforementioned fruits that were eaten by the children were mostly in the community and SAC plucked them by themselves or their friends plucked it for them to eat. The fruits that they had to buy with their money were less consumed among the study group.

Almost (99%) all the SAC ate an animal source food in the past 48hours. This is higher than what has been observed among SAC in other studies. Ene-Obong and Ekweagwu, (2010) reported that less than 2% of 5-14 years pupils in their study ate animal based foods such as chicken, eggs and meat. These children were from a

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predominantly farming community (Ene-Obong and Ekweagwu, 2010). The reason for this difference may be due to a number of factors. Firstly, most SAC involved in this present study were either part of NSFP or GSFP. NSFP meals observed during the data collection period were always accompanied with fish, chicken, egg or sausage. GSFP also had anchovies added to the meals on some days so there is a likelihood of children consuming an animal source food. Another possibility is that most of the foods that SAC reported eating based on the 24 hour recall at school were with an animal source food. SAC at Danfa Basic sch ool reportedly bought fried yam with chicken or sausage mostly at break sections of school hours. Also considering the fact that most SAC ate at least a meal at home in a day, it is likely caregivers added an animal source food.

Dietary diversity scores, DDS for GSFP participants was 5.46 ± 1.00 and NSFP participants was 5.51 ± 1.15 based on 9 food groups proposed by FAO (FAO, 2011). Whiles assessing the impact of GSFP in 4 districts in the Central region of Ghana, Martens (2007) observed that GSFP increased the DDS of the participants of SFP by 1.0 ± 0.8. A similar statement cannot be made in this context that SFP meals are contributing to DDS of SAC. However, SFP meals included vegetables like okro and cabbage as well as legumes such as beans which may have the potential of increasing dietary diversity scores if such foods were absent in the diet of SAC.

5.2 Nutritional Status

This study found a high prevalence of malnutrition among SAC. Other studies have also reported similar results. The prevalence of anaemia among SAC was lower (28.8%) than the national prevalence of 71% (FAO, 2009). This may have been as a result of deworming exercise that the Ghana Health Service had embarked on prior to the study.

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Other studies in Ghana which were not on a national scale have also found anaemia prevalence of 70 % among SAC (Fentiman et al., 2001), 72.5% among children 2-10years (Egbi, 2012) and 25% among 9months to 11years vegans and non-vegans (Osei-Boadi et al., 2012). It must be noted that apart from Fentiman et al., (2001), the other studies that have been mentioned earlier included pre-schoolers.

It has been well established that pre-schoolers have a higher prevalence of anaemia than school age children (FAO, 2009). The prevalence of anaemia found in this study was however close to what WHO has estimated. According to WHO, (2008), 25.8% of the world populace of SAC are anaemic.

The prevalence of low BMI for age, thinnes that was observed among the SAC interviewed was 34.6%. This prevalence was higher than what Chesire et al. (2008), observed among Kenyan SAC (4.5%). However the prevalence of low BAZ was lower than the 47% low BAZ observed by Danquah et al., (2012) among participants and non-participants of GSFP.

About 1% of SAC were in the overweight category. The prevalence of overweight among the SAC was relatively lower than what other studies have reported among SAC. Among Malaysian 1373 primary school children (9-10yrs), 16.3% of them have been reported to be overweight (Zaini et al., 2005). A further 6.3% of the children were obese (Zaini et al., 2005). Also among 360 rural Nigerian SAC, the prevalence of overweight was observed to be 4.7% and none of these SAC were obese (Ene-Obong and Ekweagwu, 2010). Also a study in South Western Nigerian, among 600 SAC from both private and public schools found that none of the SAC from the public schools were overweight (Olumakaiye, 2013).

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The prevalence of stunting (45.8%) observed in this study is close to the range of 48 to 56% prevalence of stunting that has been reported in low income countries such as Ghana, Tanzania, Indonesia, Vietnam and India (PCD, 2002). Contrary to what was found in this study, Danquah et al., (2012) found a higher prevalence of stunting (52.2%) among class 5 pupils in participating and non-participating schools of GSFP. Stunting was the most prevalent nutritional deficit among SAC interviewed. About 5 out of 10 SAC interviewed were stunted compared with 3 out of 10 SAC having low BMI for age. Apparently, other studies have also documented similar results 30.2% against 4.5% for low BMI for age (Chesire et al., 2008) and 52.2% against 47% for BMI for age (Danquah et al., 2012). However in Northwest of Ethiopia, a study revealed that low BMI for age (37.2%) was more prevalent among SAC than low Height for age, stunting (30.2%) (Mekonnen et al., 2013).

It was alarming to find that as many as 6 out of the SAC interviewed had at least one nutritional deficit. In Pakistan, Mian et al., (2002) reported that 4 out of 10 of SAC had at least one nutritional deficit. Nutritional status that was measured in the study (Mian et al., 2002) was underweight, stunting and wasting and not anaemia status. Also, among 789 Nepalese children Joshi et al., (2011) found 1% of them to be either stunted or wasted. A further number of 4 out of 10 SAC in this present study who had any deficit were found to have more than one deficit. This calls for concern to address immediately malnutrition among children because the burden may lead to adverse consequences.

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5.3 Energy and Nutrient Intakes of SAC and Contribution of SFP meals to total intakes

Data obtained shows that most SAC consumed adequate intake of energy and selected nutrients except for calcium intakes. Among SAC who were participating in GSFP and NSFP, calcium consumption was very low. According to Henry and Chapman, (2002), Calcium intake of Africans is as low as 300-400mg/day. It is not surprising that the average intake was observed to be 384 ± 170 among the SAC interviewed. The average calcium content of meals consumed by SAC in the past 48hours was lower than recommended DRI for SAC. This is not surprising since the diet of children as observed in the food groups consumed showed that most of them were not consuming dairy products and green leafy vegetables which are also rich sources of dietary calcium.

Participants of NSFP had significantly higher intakes of energy, protein and zinc than participants of GSFP. Studies which have compared dietary intakes of participants and non-participants of SFP have reported higher dietary intakes among participants than non-participants of SFP. In 2004, Ahmed found that participants of SFP in rural areas had a higher intake of energy than non-participants. Among 320 Kenyan primary pupils, it was observed that participants had a higher intake of energy (2089 ± 12.41 kcal vs. 1841 ± 15.68 kcal) and protein than non-participants (Musamali, 2007). This study cannot be likened to those described above; all SAC were participating in either NSFP or GSFP.

The higher intake of energy observed in this present study may have been as a result of the amount of food served by the NSFP. The NSFP provided more food and thus more of these energy and nutrients to SAC. Further analysis showed that the amount of food served by GSFP and the percent contribution of GSFP to SAC was significantly lower than that of NSFP. In Bangladesh, where fortified biscuits are used as a SFP mid-

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morning snack, it contributes to 16.4% and 14.8% of energy intakes in participants in urban and rural communities respectively (Ahmed, 2004). In this present study, the energy provided by GSFP (16.2 %) was similar to what Ahmed found in Bangladesh. NSFP was however found to provide 28% of daily energy intakes of SAC.

The mean energy content of meals served by GSFP in three schools participating in GSFP in the Ashanti Region was reported to be 460.4 ± 30.1 kcal (Danquah et al., 2012). The energy content of the meals was higher than what was observed in this present study (295 ± 94kcal). However, it is worth noting that likewise this study, Danquah et al., (2012) also found that GSFP meals did not meet any of the energy and nutrient content that has been set.

5.4 Predictors of Nutritional Status (Hb, BAZ, HAZ)

There were no significant association between most of the socio-demographic, morbidity and dietary variables and nutritional status (Hb, BAZ, HAZ) of SAC. Studies have documented that nutritional status of SAC is well predicted by these aforementioned characteristics. The most surprising of these characteristics is household food security.

In Taras (2005) review of 10 articles on food insufficiency and performance and cognitive ability of SAC, he reported that household food insecurity was enough to cause changes in the height and weight ratios of SAC. BAZ, HAZ and haemoglobin levels of SAC were not associated with household food security. Household food security under normal condition affects nutritional status of children. If the household is food insecured, it is likely that children will not have adequate access to balance meal. However, according to Nord and Hopwood (2007), children are least susceptible to food insecurity.

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This is so because food insecured households with children tend to shield their younger children from the effect of the family's food insecurity (Nord and Hopwood, 2007). This may explain why food security did not significantly affect nutritional status of SAC. Also, it may be due to the fact that food security does not necessarily mean nutrition security. SAC may have been food secured or shielded from food security however, the effects of other components of nutrition security such as care may have contributed to the poor nutritional status observed among SAC interviewed.

Dietary intakes of SAC could not predict significantly the nutritional deficits observed among them except for BMI for age and height for age. However, these two indices were significantly not related to energy intakes (β=0.000; $p \leq 0.046$). Consistent with this finding, Chesire et al., (2008) also reported that there was no association between SAC eating a balanced meal in the past 24hours and their nutritional status.

Contrary to what was observed, it has been well established that inadequate dietary intake leads to poor nutritional status among SAC (Abudayya et al., 2011). A study in Nigeria among SAC found a positive linear relationship between nutrient adequacy of a primary school child's diet and their nutritional status (Hassan et al., 2012). It is worth noting that current nutritional status is not only a reflection of current dietary intakes but also past intakes. Thus what was observed in this study in reference to dietary intakes not predicting significantly current nutritional status of SAC may be as a result of past dietary intakes.

5.4.1 Other Predictors of Haemoglobin level

This present study found an association between lower educational level of caregiver as well as micronutrient supplementation of SAC in the past 6 months and lower

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haemoglobin level. The association between micronutrient supplementation is quite surprising because micronutrient supplementation leads to increase in haemoglobin level. As such SAC who have received micronutrient supplement should have a higher haemoglobin level than those who did not. However, bivariate analysis showed that 71.8% of SAC who received nutrient supplement in the past 6 months fell ill sometimes in the past 6months ($p<0.001$; data not shown). It is therefore likely that ill health observed among SAC who received nutrient supplement may have reduced the haemoglobin concentration in their blood. Consistent with other studies, this present study found that caregivers with lower educational level (<JHS) had SAC with lower haemoglobin levels (Srivastava et al., 2012).

5.4.2 Other Predictors of low BMI for age (BAZ)

Findings from this study indicate that there was a positive association between BAZ and younger age (<10yrs). Thus younger SAC had a high BAZ. Studies among SAC have documented low BAZ among older SAC (≥10yrs). Among rural Pakistanis' SAC, it has been found that there is a significant increase in low BMI for age among SAC boys with age ($p=0.034$, Mustaq et al., 2011). Younger age predicting high BAZ may be due to the fact that these SAC may have had little nutritional deficit during their pre-school age.

Most nutritional interventions are targeted at preschoolers (Bundy et al., 2009). Considering the fact that most nutrition intervention are targeted at pre-schoolers which is a stage that is closer to the younger SAC group, It can be said that these younger SAC may have benefited from such interventions.

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5.4.3 Other Predictors of Stunting

Findings from this study indicate that there was an association between the educational level of caregivers and height for age of SAC. Educational status of caregivers higher than JHS was positively associated with HAZ. Thus these caregivers had SAC with higher HAZ. Consistent with this finding, Malekzadeh et al., (2003), found that caregivers with lower educational level had more stunted SAC and those with higher education had lesser numbers of stunted SAC. Also, in Sristava et al., (2012) study of nutritional status of SAC in India, they found that mothers' with a lower educational level ($<6^{th}$ grade) were more likely to have undernourished (stunted or underweight) children.

Furthermore, there was a positive association between caregivers' occupation and height for age of SAC ($p \leq 0.021$). Unemployed caregivers were observed to have SAC with high height for age. Contrary to this finding, Malekzadeh et al., (2003), found that unemployed caregivers had more stunted SAC than employed caregivers. It may be that the caregivers who were not working in this study were able to provide care for their children and thus the higher height for age observed. Also, traders and vocational workers had SAC with higher height for age. These can be attributed to the income gained from these occupations which has a potential influence on access to adequate food and health care.

5.4.4 Other Predictors of Having at least one Nutritional Deficit

The significant predictors for having at least one nutritional deficit among SAC were age of SAC and caregivers' occupation. This study found that caregivers who were engaged in other occupation category such as farmers, stone winnowers were 3.5 times more likely to have undernourished (having at least a nutritional deficit) SAC than traders. It is

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likely that caregivers who were involved in the other occupation category were so busy that they were giving less care to their SAC.

5.5 Nutritional Status (Hb, BAZ, HAZ) and School Attendance and Performance

There was no relation between current nutritional status of stunting, thinness, anaemic and school attendance and performance of SAC in core subjects (Maths, English and Science) in the past term. However, significant association was observed between having any form of nutritional deficit and performance of SAC in Mathematics and English but not Science. It has been well established that nutritional status of children affects their attendance at school. Malnourishment increases susceptibility to illness (Joshi et al., 2011). Children who are suffering from ill health are unlikely to attend school on a regular basis.

A study by Chesire et al. (2008), in Nairobi found an association between stunting and school attendance. About 70% of stunted SAC were less likely to attend school as compared with 56% of non-stunted SAC (p=0.044). In this research stunting was not associated with attendance.

Any SAC who was normal in terms of each indices (Hb, BAZ, HAZ) assessed was not significantly different from the undernourished SAC in terms of attendance and school performance in Mathematics, Science and English in the past term. However, SAC who did not have any nutritional deficit were found to have significantly higher scores in Mathematics (Mean difference=-4.62; p=0.037) and English (Mean difference=-4.49; p=0.027) than those who were undernourished.

Amongst Malaysian primary school children, it has been found that academic scores in English, Mathematics and Science increases with increasing BMI for age.

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Overweight children had the highest marks but scores decline among the obese children (Zaini et al., 2005). SAC who were normal may have been healthier and have had good cognitive abilities and hence the outcome observed.

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CHAPTER 6

6.0 CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS.

6.1 Conclusion

There is a high prevalence (67%) of undernutrition among SAC participating in NSFP and GSFP at Otinibi and Danfa. At least 3 out of 10 SAC are anaemic or thin (low BAZ) and about 5 out of 10 are stunted. The significance of this situation calls for immediate attention since it may have health implications on SAC.

All SAC engaged in 3 or more eating events on school days and about a quarter (25± 4%) of these foods was SFP meals. The mean dietary diversity score was higher than half of the 9 food groups used for its estimation (5 ±1). However, most SAC rarely consumed dark green vegetables and organ meats in the past 24hours.

Meals provided by GSFP did not meet any of the macronutrients recommendations set by World Food Programme, WFP;-NSFP on the other hand met these recommendations. Meals served by NSFP contributed a higher percentage of energy (28.0 ± 10% vs. 16.2 ± 7 % for GSFP participants) and protein and other selected nutrients to the total daily intakes of SAC than GSFP meals. Also, most SAC met or exceeded dietary intake for all energy and the nutrients assessed with the exception of calcium.

Results from this study indicate that most of the socio-demographic characteristics, dietary intakes and health related variables did not predict significantly nutritional deficits among SAC. Conversely, low haemoglobin level was strongly associated with caregivers' education lower than JHS and receiving micronutrient

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supplementation in the past 6 months ($p \leq 0.009$). High BMI for age (BAZ), was significantly associated with younger age (<10yrs) of SAC ($\beta=0.342$; $p=0.010$). Energy intake of SAC was not associated with reducing or increasing BAZ and Height for age ($\beta=0.000$, $p=\leq 0.0046$).

Furthermore, higher Height for age of SAC was associated with younger age, caregiver occupation (not working, trader and vocational occupation) and educational level higher than JHS. The study identified predictors of having at a least one nutritional deficit to be younger age (<10yrs) and caregiver engaged in other occupation such as farmer, stone winnower and professional workers ($p<0.05$). Whereas younger age SAC were 0.49 times less likely to have a nutritional deficit, caregivers who were engaged in the other category of occupation were 3.5 times more likely to have a nutritional deficit than traders.

Current nutritional status (BAZ, HAZ, Hb and having any deficits) of SAC was not in any way related to how children attended school and performed in core subjects in the past term. However, SAC with at least a nutritional deficit had significant lower scores in Mathematics (Mean difference=-4.62) and English (Mean difference=-4.49) in the past term than normal SAC ($p<0.05$).

6.2 Limitations

An important limitation of the study is that haemoglobin assessment of SAC was not done in duplicates for either a subsample or all the SAC whose anaemia status were assessed because of scarce resources. Such analysis would have been ideal for validating the haemoglobin levels of SAC.

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Another limitation is the assessment of school attendance and performance in the past term. Most of the studies that have looked at school attendance were based on current attendance. Also, school performance have been assessed in some studies using an on the spot test for the subjects and Raven test. A greater picture of the relationship between nutritional status and academic performance would have been observed if current nutritional status was compared with current school attendance and performance.

6.3 Recommendations

- Considering, the high level of malnutrition among SAC, regular monitoring of SAC's nutritional status may be necessary.
- The study revealed that most meals that SAC eat are consumed at home. Thus, caregivers of SAC should be encouraged to include more green vegetables, dairy products and organ meats in their children's diet, if only it would be possible so as to increase the nutrient quality of their diet.
- The energy and macronutrient content of meals served by GSFP was inadequate when compared with WFP recommendations. There is therefore the need to review the quantity of meals served so as to ensure adequacy to diets of SAC. Efforts such as increasing the cost of meal of GSFP may be necessary in this regard.
- Given the high cost of meals served per each child participating in NSFP, it would be necessarily to do a cost benefit analysis to know whether the cost is really worth what it is.

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- Future studies should assess menus randomly and over a period of at least 3 months so as to have a good compilation of nutrient content of SFP meals as well as account for seasonal variability of foods.
- This current research was done in two schools with SFP, further studies should be done on the national level to assess the nutrient content of meals served by SFP to inform recommendations for improvement.

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Appendix I: Ethical Clearance Certificate

NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH
Established 1979 A Constituent of the College of Health Sciences
University of Ghana

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+233-289-522574
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E-mail: nirb@noguchi.mimcom.org

NMIMR-IRB
P. O. Box LG 581
Legon, Accra
Ghana

My Reference: DF 22
July 29, 2013.
Justina S. Owusu, Mphil C
UG Dept of Nutrition and Food Science
RE: Our Study # 012/12-13 **At:** NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH-IRB

Dear Justina S. Owusu, Mphil C:
Meeting Date: 9/5/2012 **At:** NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH-IRB
Protocol Title:
Assessment of dietary intake and nutritional status of school aged children at Otinbi and Danfa basic schools
This is to advise you that the above referenced Study has been presented to the Institutional Review Board, and the following action taken subject to the conditions and explanation
provided below.
Internal #: New Appl
Expiration Date: 9/4/2013
On Agenda For: Initial Submission
Reason 1: **Reason 2:**
Description: Date Received- 8/22/2012
IRB ACTION: Approved
Condition 1:
Action
Explanation:

Yours Sincerely,

Helena Baidoo
IRB Administrator
NMIMR-IRB

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Appendix II: Parental Consent Form

Title of Study: Assessment of dietary intake and nutritional status of school aged children participating in school feeding programmes at Otinibi andDanfa Basic Schools.

Investigators: JustinaSerwaahOwusu(Graduate Student)
Dr. Esi Colecraft (Supervisor)
Dr. Richmond Aryeetey(Co- Supervisor)

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

General Information about Research

You are being invited to participate in a research study with your child who attends public school in Otinibi or Danfa. The purpose of the study is to assess the diet and nutritional status of school age children participating in school feeding programmes in the two communities. We are also interested in finding out whether there is an association between the nutritional status of school children and their attendance and performance in school.

Description of Procedures

If you agree that your child should participate in this research study, you will be visited in your home and interviewed about your personal and household characteristics, such as your age, level of education, marital status and number of children in your household. You will be asked questions about your family eating habits. The interview will take about 30-45 minutes. In addition, we will interview your school child about his/her eating habits and take weight and height measurements. For some of the children we will assess their anaemia status. If your child is selected for this, we will obtain a small sample of blood by pricking the finger. With your permission, we will also record information on your school attendance and performance in core subjects for the previous semester from his/her school records.

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Possible Risks and Discomforts
There are no risks to you or your child for participating in this study. The children who are selected for anaemia assessment may experience slight discomfort from the finger prick for the blood sample.

Possible Benefits
There is no direct benefit to you and your child from participating in this study, however the knowledge gained from the study will be useful for making recommendations to improve the nutrition and health of school going children in this and other communities

Confidentiality
Any information obtained from you and your child's participation in this study will be kept strictly confidential and be used for research purposes only. Only the researcher will have access to your information. However, you and your child's name will never be used in any presentations, papers or reports

Compensation
Your child will receive an exercise book and a pencil at the end of the research for his participation. Also, you will be given a small bar of soap at the end of the interview in appreciation of your participation in the study

Voluntary Participation and Right to Leave the Research
Participating in this study will be at no cost to you. Participation in this study is voluntary. You and your child can choose to withdraw from the study at any stage without penalties or loss of benefit. Being part of this study will not affect your child's involvement in the school feeding programme.

Contacts for Additional Information
If you have any questions concerning the study or you have concerns, please contact Dr .Esi Colecraft of the Nutrition and Food Science Dept., University of Ghana. Tel 0244 107 633 or Justina Serwaah Owusu on Tel 0246 361 723

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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 or HBaidoo@noguchi.mimcom.org . You may also contact the chairman, Rev. Dr.Ayete-Nyampong through mobile number 0208152360 when necessary.

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title assessment of dietary intake and nutritional status of school age children at Otinibi and Danfa primary schools 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.

_____ _____

Child's name Name of child's guardian/parent

___ _____

Date Signature or mark of child's guardian/parent

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

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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

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Appendix III: Caregiver and Child Questionaire

Section A: Caregiver Characteristics

1. What is your relationship to the school aged child?
   RELCHD
   1=Mother 2=Father 3=Grandmother 4=Older sibling
   5=Aunty/uncle 5=Other (specify) _____
2. How old are you? AGECG ☐
3. Which ethnic group do you belong to? ☐

   WTRIB

   1=Akan 2=Ewe 3=Ga /Ga - Adangme 4=Northern ethnicity
4. What level of education have you completed? MEDUC ☐

   0=None 1=Primary 2=JHS/Middle Sch 3=Secondary
   4=vocational 5=Post secondary
5. What is your primary occupation? MOCC ☐
   1=Teacher 2=Farmer 3=Vocational Occupation** 4=Trader
   5=Housewife 6=Other (Specify)_____
   **** Caterer, Baker, Seamstress and Hairdresser**
6. What is your marital status MSTAT ☐
   1= Single 2= Married/Cohabiting 3= Divorced 4= Widowed
7. What is your spouse/partner's level of education? SPEDU ☐

   0=None 1=Primary 2=JHS/Middle Sch 3=Secondary
   4=vocational 5=Post secondary
8. What is your spouse/partner's main occupation? ☐
   SPOCC

   0=Not employed 1= Farmer 2=Trader 3=Vocational occupation
   4=Teacher 5=Other (Specify_____)

Section B: Household Characteristics

9. On the average, how much income does your family earn in a month? ____ ☐
   EARNM

   1=< GH¢100 2=GH¢100-300 3=> GH¢300 4=Other_____
10. On the average, how much income do you spend on food that your ☐
    HINCDY

    household eat in a day? GH¢_____
11. How many children (<18 y) in your household? CHDHD ☐

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12. How many of these children are your biological children?

    CHDOWN

13. What is the position of the index child in the birth order?

    BTHODR

14. How many adults (≥ 18y) are part of your household?

    ADLTHD

15. What is the total number of people (adults + children) in your household TOTHLD

16. How old is your index school aged child?

    CHDAGE

Section C: Household and Child Eating Patterns

17. Usually, about how many times a day is food cooked for the household?

    FDCOOK

18. Is your school aged child regularly given money for food when s/he is going to school?

    0=No never 1=Yes, sometimes (about once a week) 2= Yes, about 2-3 days a week 3=Yes almost everyday

19. When your child is given money for food, about how much money does s/he get?
    AMT GHc_____

20. How many meals does your child eat at home on school days?
    MEALH

21. Does your child receive a meal at home before the evening meal on school days?
    LUNS

    0=No never 1=Yes, sometimes (about once a week) 2= Yes, about 2-3 days a week

    3=Yes almost everyday

22. Reason for the answer in question 19

    _____

    _____

Section D: Household Food-Security

Now I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 6 months.

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23. “(I/We) worried whether our food would run out before (I/we) got money to buy more.” Was that often true, sometimes true, or never true for your household) in the last 6 months?

1= Often true 2= Sometimes true 3= Never true 99= DK or Refused

WFOOD

24. “The food that (I/we) bought just didn’t last, and (I/we) didn’t have money to get more.” Was that often, sometimes, or never true for your household in the last 6 months?

1=Often true 2=Sometimes true 3=Never true 99=DK or Refused

NMONF

25. "We couldn't afford to eat balanced meals." Was that often, sometimes, or never true for your household in the last 6 months?

BALM

1=Often true 2=Sometimes true 3=Never true 99= DK or R

26. "(My/Our child was/The children were) not eating enough because (I/we) just couldn't afford enough food." Was that often, sometimes, or never true for your household in the last 6 months?

HCAFD

1=Often true 2=Sometimes true 3=Never true 99= DK or R

27. In the last 6 months, since last (name of current month), did (you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

CSIML

1=Yes 2=No 99= DK or R

28. [IF YES ABOVE, ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?

MTHLY

1= Almost every month 2=Some months but not every month

3= Only 1 or 2 months 99= DK or R

29. In the last 6 months, since (current month) of last year, did you ever cut the size of (your child's/any of the children's) meals because there wasn't enough money for food?

1= Yes 2=No 99= DK or R

CMLSC

30. In the last 6 months, did (CHILD’S NAME/any of the children) ever skip meals because there wasn't enough money for food?

CHSKM

1= Yes 2=No 99=DK or R (SKIP 14a)

31. [IF YES ABOVE ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?

MTHLY

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1=Almost every month 2=Some months but not every month
3=Only 1 or 2 months 99=DK or R

Section E. Health information of child

32. In the past six months, has your child ever fallen sick? ☐
CSICK
0=No never 1=Yes

33. If yes, what illness did your child suffer from? ☐
WILLN
1=Malaria 2=Diarrhoea 3=Fever 4= Other (specify)_____

34. What kind of treatment did the child receive when he / she was ill? ☐
CTRTI
0=None, s/he got healed after sometime 1=Medical treatment 2=Local herbs treatment 3=Other (specify) _____

35. In the past six months, did your child receive any kind of deworming ☐
DWORM
medication?
0=No 1=Yes

36. Have you given your child any nutrient supplement in the past 6 months? ☐
CNUTRS
0=No 1=Yes, a mineral supplement 2=Yes, a vitamin supplement
3=Yes, a vitamin and mineral supplement 4=Other (specify) _____

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Child Questionnaire

A. Socio- demographic characteristics

1. Sex YSEX ☐

   1=Male 2=Female

2. How old are you? HOLD ☐

3. Which class are you in? WCLAS ☐

5. Which religion do you belong to? DREL ☐

   1=Islam 2=Christian 3=Traditional 4=Other (Specify)

6. Where do you live? _____ WRLIV ☐

   1= Otinibi 2=Danfa 3=Adoteiman 4=Other (specify) _____

7. Who do you live with? LIWTH ☐

   1= Both parents 2= Mother alone 3= Father alone
   4= Older siblings 5= Other relation (Specify) .....

B. Child eating habits

8.. In general, how many meals do you eat on school days? ..... WKMEL ☐

9. How many of these meals do you eat at home? CMEALH ☐

10. How many of these meals do you eat in school? CMEALS ☐

11. Which meals do you eat on school days? (Tick as many as apply) WEMEK ☐

    1= Morning meal [ ] 2= Afternoon meal [ ] 3=Evening meal [ ]

12. Where do you get meals and how are they obtained on a school days?

Meal	**Do you usually eat these meals** (0=No 1=Yes)	**Place Eaten** (1=School 2= At home)3=Other(Specify)	**Source(** 1= Home prepared 2= Bought from a vendor 3= School feeding programme)
Morning meal			
Afternoon meal			
Evening meal			

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Appendix IV: Menu of NSFP and GSFP

Appendix IVa: Original Menu of GSFP at Danfa

Day	GSFP (Danfa)
Monday	Rice and Tomato stew or Palava sauce
Tuesday	Waakye and Tomato stew
Wednesday	Beans and Gari
Thursday	Banku Okro or palmnut soup and dried fish
Friday	Jollof and anchovies

Appendix IVb: 4-weeks Menu served at GSFP and NSFP

Week	Day	Danfa (GSFP)	Otinibi (NSFP)
1	Monday	Rice and Tomato stew	Rice tomato stew and Sausage
	Tuesday	Waakye and Tomato stew	GariEba, light soup and chicken
	Wednesday	Jollof and anchovies	Kenkey, hot pepper and fried fish
	Thursday	Banku Okro soup and anchovies	Waakye, tomato stew and sausage
	Friday	Jollof and anchovies	Banku, light soup and fried fish
2	Monday	Rice and Tomato stew	Rice tomato stew and Sausage
	Tuesday	Waakye and Tomato stew	Gari eba, light soup and chicken
	Wednesday	Jollof and anchovies	No food served because of gas shortage
	Thursday	Jollof and anchovies	Rice, tomato stew and egg
	Friday	Banku Okro soup and anchovies	Banku, light soup and fried fish
3	Monday	Rice and Tomato stew	Rice, tomato stew and egg
	Tuesday	Waakye and Tomato stew	Rice, tomato stew and sausage
	Wednesday	Jollof and anchovies	Banku, light soup and chicken
	Thursday	Banku Okro and anchovies	Yam, cabbage stew with Tuna
	Friday	Jollof and anchovies	Gari eba, light soup and chicken
4	Monday	Rice and Tomato stew	Rice, tomato stew and sausage
	Tuesday	Waakye and Tomato stew	Yam with cabbage stew and Tuna
	Wednesday	Jollof and anchovies	Kenkey, hot pepper and fried fish
	Thursday	Banku and Tomato stew	Waakye, tomato stew and boiled egg
	Friday	Jollof and anchovies	Gari eba, light soup and chicken