

# Nutritional Status of Pupils Attending Public Schools with and without School Feeding Programme in Hohoe Municipality, Ghana

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**Abstract** At-school lunch provision through the Ghana school-feeding programme (GSFP) is a child survival, health promotion and food security intervention implemented in selected schools in all 216 districts nationwide with the nutrition objective of reducing short-term hunger and malnutrition. The study assessed the impact of the Ghana School Feeding Programme (GSFP) on the nutritional status of participants. School-based cross-sectional survey using multi-stage sampling to select 417 pupils aged 3-12 years enrolled in 14 public basic schools with (n=133) and without (n=304) school feeding programme in the seven sub-districts of the Hohoe municipality, Ghana. Data was collected between January-April 2015 through face-to-face interviews using a semi-structured questionnaire with assistance from teachers/guardians. Weight, height and mid upper-arm circumference were measured and used to generate underweight, stunting, thinness and obesity using WHO Antroplus and STATA 12.1. Mutually-adjusted simple and multinomial logistic regressions were done to determine association between the explanatory and dependent variables. Overall, 15.6% underweight, 9.8% stunting, 4.3% thinness and 5.5% overweight prevalence were observed. Between beneficiary and non-beneficiary pupils, there were no statistically significant differences in underweight (12.4% vs. 16.8%), stunting (13.3% vs. 8.6%), thinness (1.8% vs. 5.3%) and overweight (3.5% vs. 5.6%) respectively. Most of the explanatory variables including provision of schools meals were not significantly associated with the nutritional status indicators. Pupils in lower primary had increase odds for underweight (AOR; 3.0, 95% CI; 1.4-6.6, p=0.006) while those residing in rural areas were five folds more likely to be stunted (AOR; 5.3, 95%CI; 1.3-21.6, p=0.021). Prevalence of malnutrition was lower among beneficiaries but there were no statistical significant differences in anthropometry between schools with and without feeding programme. Findings suggest that the school feeding programme could marginally improve nutritional status of beneficiaries.

**Keywords:** school feeding programme, Ghana, nutritional status, anthropometry, school meals, school age children, malnutrition

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## 1. Introduction

Childhood malnutrition is a public health problem in most developing countries with adverse consequences on the socio-economic development of nations. Globally, a quarter of children under-five years are stunted with 15% underweight, 8% wasted and 6% overweight. Prevalence of overweight in Sub-Saharan Africa is same as the global situation. However, there are higher levels of stunting (37%), underweight (21%) and wasting (9%) [1]. In recent years in Ghana, substantial progress has been achieved in reducing undernutrition among children under 5 five years. The 2014 Ghana demographic and health survey revealed a stunting prevalence of 19%, wasting 5% and underweight 11% [2]. This is a decrease from the 28%

stunting, 9% wasting and 14% underweight prevalence recorded in 2008 [3]. This decrease is the result of interventions initiated by the government in collaboration with international organizations to curtail causes and effects of childhood undernutrition. Some of these interventions include growth monitoring and promotion, vitamin A supplementation, school-based nutrition education, deworming, and school feeding programme (SFP). Despite this progress, there are still pockets of high under nutrition [2,4].

Ghana is one of the 169 countries that provide daily meals to about 368 million children globally while at school [5]. The Ghana school-feeding programme (GSFP) was initiated by the Government in late 2005 in ten pilot schools covering 64,775 beneficiary pupils. Currently, the programme is implemented in all 216 districts. At the end of 2012, 1.64 million pupils were beneficiaries of the

programme [6]. Children in selected public kindergarten and primary schools are provided with at-school lunch meals every school day using locally grown foods as a means of contributing to poverty reduction and food security in the long-term. The programme has three pivotal objectives: to increase school enrolment, attendance and retention; reduce short-term hunger and malnutrition; and boost agriculture and domestic food production. Provision of school meals is thus a health improvement and child survival intervention strategy. Yet coverage as at 2013 was less than 10% [5].

Generally, literature on the impact of school feeding programmes has shown varied outcomes. For instance, impact on school enrolment and attendance has been conclusive [7-13]. However, dietary quality of school meals [14,15,16], nutritional status [8,17,18,19] and academic achievement [20,21,22] of school-aged children receiving school meals compared to non-school-fed children have been inconclusive. Similarly, in sub-Saharan Africa, evidence on the impact of provision of school meals on growth of participating school children has also showed varied outcomes. In Malawi for instance, after one school year follow-up, mid-upper arm circumference (MUAC) of participating children increased from 16.3 cm to 17.0 cm [23].

Monitoring and evaluation of impact of the SFP in Ghana have mostly focused on school enrolment, attendance and retention of school age children in schools as outcome measures [24,25,26,27]. Consequently, findings from several studies have justified the expansion of the programme based on these outcome measures. A few studies have examined other impacts relating to community involvement in implementation and socio-economic effects of the programme [28,29,30]. Few studies have also assessed impact of the programme on anthropometry. A study conducted in 2012 in Atwima-Nwabiagya District of the Ashanti Region aimed at assessing the nutritional status of participating and non-participating school children aged 9 to 17 years did not find any statistically significant difference in the anthropometric measurements between the two groups [4]. In northern Ghana, although provision of school meals contributed to significantly higher energy and micronutrient intakes among participants, there were no differences in the prevalence of thinness, underweight and stunting among the participating and non-participating school children [31]. In some instances, prevalence of undernutrition was even higher among children enrolled in schools on feeding programme [32].

To ameliorate the financial, personnel, technical and policy challenges associated with implementation of school feeding programmes, a number of strategies have been recommended. These include monitoring and evidence-based impact evaluation of focal areas of school feeding programmes [8,33], integration with other programmes, improving intersectoral decision making [15], and clear policy direction on the implementation process [13]. In Ghana, evaluation of the SPF has focused mostly on impact on enrolment and attendance. Since reduction of malnutrition is a core objective of the programme, it is important that this objective is routinely evaluated to assess the level of achievement. It is against this background that this study was conducted to assess the effects of enrolment in schools in which free meals are

provided on the levels of underweight, stunting, wasting and overweight between beneficiary and non-beneficiary school children.

## 2. Methods

### 2.1. Study Area

The study was conducted in the Hohoe municipality, one of the 25 administrative districts in the Volta region of Ghana. The municipality is situated in the middle of the region with an estimated population of 167,016 inhabitants comprising 52.1% females and 47.9% males living in over 180 rural (47.4%) and urban (52.6%) communities. The population of the municipality is youthful with 35.9% under age 15 years [34]. The municipality covers a total land area of 1,172 square kilometres and divided into seven zones called sub-districts for administrative purposes. These seven sub-districts are; Akpafu, Agumatsa, Alavanyo, Gbi, Lolobi, Hohoe and Likpe. Hohoe sub-district is urban; some parts of Gbi and Likpe are peri-urban while the remaining ones are rural. However, schools with meals were evenly distributed over both rural (27.6%) and urban (26.5%) areas.

### 2.2. Design, Target Population and Sampling

An exploratory school-based cross-sectional design was used. The target population was school age children enrolled in public (state-owned) basic schools within the Hohoe municipality. In Ghana, basic schools provide formal education that entails foundation courses starting from kindergarten to the junior high school level. The Ghana School Feeding Programme (GSFP) covers public basic school pupils from kindergarten to primary six who are usually within the ages of 3-12 years. Pupils in kindergarten are preschoolers while those from primary one to six are school age children with primary one to three termed lower primary and primary four to six termed upper primary. There are 69 public basic schools within the Hohoe municipality with a total population of 17,265 pupils out of which 15 are participating in the GFSP with about 4,000 beneficiary pupils constituting approximately one-fourth of the pupil population.

The sample size was determined using alpha of 1.96 at 95% confidence interval with a permitted 3% margin of error considering a 17% [2] population prevalence of undernutrition. This generated a sample size of 417. A multi-stage sampling method was used in the selection of study schools and participants. There are seven sub-districts in the municipality. To get a representative sample, the seven sub-districts were considered as clusters. Two public primary schools were randomly selected from each cluster; one implementing the GSFP and another without any school feeding programme as control. Within the schools, each level from kindergarten to primary six was treated as a stratum. Using the class register as the sampling frame, proportionate number of males and females were systematically sampled from each stratum. Only pupils who were enrolled in the schools for at least one academic year were eligible to be included in the study.

### 2.3. Data Collection Tools and Procedures

Data was collected at the second term of the 2015 academic year specifically from January to April through face-to-face interviews using a semi-structured questionnaire designed to achieve the objectives of the study. Participants in upper primary were personally interviewed whereas parents and guardians and sometimes teachers of pupils in kindergarten and lower primary were invited to provide responses to the interviews. Responses elicited included age, class, occupation of the child's guardian, and frequency of fruit and breakfast consumption by the child per week. Anthropometric measurements were taken following WHO standard anthropometry guidelines. Height was measured using 'SECA' stadiometre to the nearest 0.1 centimetres, weight using digital weighing scale to the nearest 0.1 kilogram and mid-upper arm circumference (MUAC) using non-extensible MUAC tape to the nearest 0.1 millimetres. Measurement errors were reduced by engaging trained nutrition officers employed by Ghana Health Service to assist with data collection.

### 2.4. Statistical Analysis

Weight, height and MUAC measurements were converted to weight-for-age Z-scores (WAZ), height-for-age Z-scores (HAZ), body mass index (BMI), BMI-for-age Z-scores (BAZ) and MUAC-for-age z scores (MAZ) using WHO Anthroplus software (version 10.4). The resulting indices were used to determine the levels of underweight (WAZ < -2 SD), stunting (HAZ < -2 SD), thinness (BAZ < -2 SD) and overweight (BAZ > 1 SD). Data entry and analysis was done using STATA (version 12.1). Both descriptive and inferential statistics were used in analyzing and reporting findings. Differences in participants' characteristics between the intervention and control groups were determined using Pearson's Chi-square test for categorical variables, which were presented as frequencies and proportions. Student's t-test was used for continuous variables involving two categories and reported as means with standard deviations (SD). The association between the explanatory variables under investigation and the

dependent variables, that is, underweight and stunting were determined using simple logistic regression. To get the best fit, the regression analysis was mutually adjusted for all the variables included in the model. Multinomial logistic regression model was used to determine the association between BMI-for-age Z-scores (BAZ) and the explanatory variables. This regression was used because the BAZ was classified into three categories; thinness, normal weight and overweight. Differences were significant if  $p < 0.05$  at 95% confidence interval.

### 2.5. Ethical Considerations

The study protocol was reviewed and approved by the Ghana Health Service Ethics Review Committee (ethics approval ID GHS-ERC:15/04/15). Permission was granted by the Municipal Health and Education Directorates of the Hohoe municipality. Informed consent was obtained from parents and guardians of the school children while the participants provided assent to participate in the study.

## 3. Results

Overall, the proportion of the school pupils who were underweight was 15.6% while those who were stunted were 9.8%. Moreover 4.3% were thin (wasted) for their age whereas 5.5% were overweight.

As seen from Table 1, 12.4% of the pupils who attended schools implementing the Ghana feeding programme were underweight while 16.8% of those who attended schools without any feeding programme were also underweight. About 13.0% of beneficiary pupils were stunted as against 8.6% of non-beneficiary pupils. Thinness was 1.8% among pupils attending the GSFP schools and 5.3% among pupils attending schools without the school feeding programme. Moreover, 3.5% of those attending schools implementing the GSPF were overweight as compared to 5.6% of pupils attending schools without any feeding programme. However, the differences in underweight, stunting, thinness and overweight observed between the two types of schools were statistically non-significant.

**Table 1. Characteristics of study participants based on the type of school attended**

	Variables	School feeding (n/N%)	Non-school feeding (n/N%)	P-value <sup>1</sup>
Anthropometry	Underweight	44/113 (12.4)	51/304 (16.8)	0.272
	Stunting	15/113 (13.3)	26/304 (8.6)	0.150
	Thinness	2/113 (1.8)	16/304 (5.3)	0.119
	Overweight	4/113 (3.5)	17/304 (5.6)	0.394
Sex	Male	56/206 (27.0)	150/206 (73.0)	0.969
	Female	57/211 (27.0)	154/211 (73.0)	
Age groups	3-5	19/78 (24.4)	59/78(75.6)	0.546
	6-12	94/339 (26.7)	245/339 (73.3)	
Class	Kindergarten	30/112 (26.8)	82/112 (73.2)	0.964
	Lower primary	42/158 (26.6)	116/158 (73.4)	
	Upper primary	41/147 (28.0)	106/147 (72.0)	
Geographic location	Rural	79/291 (27.0)	212/291 (73.0)	0.972
	Urban	34/126 (27.0)	92/126 (73.0)	
Guardian's Occupation	Formal	5/22 (22.7)	17/22 (77.3)	0.005
	Petty trader	30/135 (22.2)	105/135 (77.8)	
	Unemployed	21/52 (40.0)	31/52 (60.0)	
	Artisan	5/46 (11.0)	41/46 (89.0)	
Take fruit $\geq$ 3 times per week	Farmer	52/162 (32.0)	110/162 (68.0)	0.259
	Yes	26/81 (32.0)	55/81 (68.0)	
Take breakfast before school	No	87/336 (26.0)	249/336 (74.0)	0.069
	Yes	103/294 (26.0)	291/394 (74.0)	
	No	10/23 (43.5)	13/23 (56.5)	

<sup>1</sup>Differences in characteristics of pupils in schools with and without school feeding were generated using Pearson's Chi-square.

From Table 2, generally, no differences were observed in the mean age, weight, height, weight-for-age z-scores (WAZ), mid-upper arm circumference (MUAC)-for-age z-scores and body mass index (BMI)-for-age z-scores between pupils attending schools with and without the Ghana school feeding programme. However, pupils attending schools without the feeding programme were found to have significantly higher height-for-age mean z-scores ( $-0.28 \pm 1.2$ ) compared to those attending schools with the feeding programme ( $-0.64 \pm 1.0$ ).

Results from the regression analyses presented in Table 3 showed that generally enrolment in schools implementing the Ghana school feeding programme did not significantly reduce the pupil's odds for underweight, stunting, thinness and overweight. In the bivariate analysis to determine the factors associated with underweight, it was observed that pupils in lower primary had three times increased odds for being underweight (AOR; 3.0, 95% CI; 1.4-6.6,  $p=0.006$ )

compared to their upper primary counterparts. Highest proportions of underweight were observed among pupils attending schools in the Lipke (25.4%) and Akpafu (20.0%) sub-districts. Pupils in the Lolobi sub-district recorded the lowest proportion (5.0%) of underweight and hence had decreased odds for underweight, which was statistically significant (AOR; 0.2, 95% CI; 0.03-0.8,  $p=0.007$ ). About 16.5% of the pupils living in rural areas were underweight as against 13.5% of those living in urban areas of the municipality. There was also a high proportion of underweight (24.4%) among pupils aged 3-5 years compared to those within the ages of 6-12 years (13.6%). However, there was no statistically significant association between underweight and sex, age, guardian's occupation, residency in rural or urban areas of the municipality, consumption of fruits at least three times per week and consumption of breakfast at home before leaving for school.

**Table 2. Age and anthropometry of pupils attending schools with and without the Ghana school feeding programme**

Variables	School feeding n=113 (Mean±SD)	Non-school feeding n=304 (Mean±SD)	P-value
Age (years)	8.6±2.6	8.3±2.7	0.3015
Weight (kg)	25.2±8.6	24.7±8.4	0.6137
Height (cm)	125.4±15.3	125.4±14.1	0.9905
MUAC	17.30	17.28	0.9255
WAZ	-1.00±1.0	-0.99±2.0	0.9254
HAZ	-0.80±0.1	-0.48±1.1	0.0057
MUAC z-score	-0.81±0.7	-0.63±1.0	0.3902
BMI-for-age z-scores	-0.53±0.78	-0.54±1.0	0.9385

**Table 3. Underweight among the pupils and related predicating factors**

Attribute	Variables	n/N(%)	AOR (95% CI)	P-value
Provided with school meals	Yes	14/113(12.4)	Reference	
	No	51/304(16.7)	1.2 (0.6-2.6)	0.466
Sex	Male	33/206(16.0)	Reference	
	Female	32/211(15.2)	0.9 (0.5-1.6)	0.729
Location	Urban	17/126(13.5)	Reference	
	Rural	48/291(16.5)	1.7 (0.6-4.8)	0.288
Age (years)	3-5	19/78(24.4)	01.8 (0.6-5.2)	0.319
	6-12	46/339(13.6)	Reference	
Sub-districts	Agumatsa	8/52(15.4)	0.6 (0.2-1.6)	0.292
	Akpafu	12/60(20.0)	0.6 (0.3-1.6)	0.335
	Alavanyo	10/60(16.7)	0.7 (0.3-1.8)	0.471
	Likpe	15/59(25.4)	Reference	0.817
	Lolobi	3/60(5.0)	0.2 (0.1-0.6)	0.007
	Gbi	8/44(18.2)	1.7 (0.6-5.1)	0.334
	Hohoe	9/82(11.0)	1	0.548
Guardian's occupation	Formal	4/22(18.2)	1.3 (0.4-4.4)	0.720
	Petty trader	17/134(12.6)	0.6 (0.3-1.3)	0.203
	Unemployed	6/52(11.5)	0.4 (0.1-1.3)	0.144
	Artisan	6/46(13.0)	1.6 (0.2-1.7)	0.342
	Farmer	32/162(19.8)	Reference	
Takes fruit $\geq 3$ times per week	Yes	6/81(7.4)	Reference	
	No	59/336(17.6)	2.0 (0.8-5.3)	0.147
Takes breakfast before school	Yes	63/394(16.0)	Reference	
	No	2/23(8.7)	0.9 (0.2-4.2)	0.863
Class	Kindergarten	23/112(20.5)	1.9 (0.6-6.4)	0.279
	Lower primary	32/158(20.3)	3.0 (1.4-6.6)	0.006
	Upper primary	10/147(6.8)	Reference	

Estimates based on maximum likelihood ratio mutually-adjusted logistic regression. Data presented as n/N(%) unless otherwise indicated. Final model was significant (Prob > Chi-square = 0.0081).

Table 4. Stunting among the pupils and related predicating factors

Attribute	Variables	n/N(%)	AOR (95%CI)	P-value
Provided with school meals	Yes	15/113(13.3)	Reference	0.183
	No	26/304(8.6)	0.6(0.3-1.3)	
Sex	Female	17/211(8.1)	0.7(0.3-1.3)	0.265
	Male	24/206(11.7)	Reference	
Location	Rural	33/291(11.3)	5.3(1.3-21.6)	0.021
	Urban	8/126(6.35)	Reference	
Age (years)	3-5	4/78(5.1)	1.1(0.2-8.3)	0.899
	6-12	37/339(10.9)	Reference	
Sub-districts	Alavanyo	10/60(16.7)	0.9(0.3-2.8)	0.905
	Lipke	10/59(17.0)	Reference	
	Agumatsa	8/52(9.6)	2.5(0.1-1.6)	
	Lolobi	2/60(3.3)	0.1(0.02-0.6)	
	Gbi	4/44(9.1)	2.5(0.6-12.7)	
	Hohoe	4/82(4.9)	1	
Guardian's occupation	Akpafu	6/60(10.0)	0.4(0.1-1.4)	0.162
	Formal	5/22(22.7)	2.9(0.8-10.4)	
	Petty trader	7/135(5.2)	0.5(0.2-1.3)	
	Unemployed	7/52(13.5)	2.0(0.6-6.4)	
	Artisan	6/46(13.0)	1.6(0.5-5.1)	
	Farmer	16/162(9.9)	Reference	
Takes fruit $\geq$ 3 times per week	Yes	8/81(9.9)	Reference	0.708
	No	33/336(9.8)	1.2(0.5-3.0)	
Takes breakfast before school	Yes	39/394(9.9)	0.8(0.1-4.2)	0.783
	No	2/23(8.7)	Reference	
Class	Kindergarten	5/112(4.5)	0.2(0.03-1.2)	0.081
	Lower primary	17/158(10.8)	0.7(0.3-1.6)	
	Upper primary	19/147(12.9)	Reference	

Estimates based on maximum likelihood ratio mutually-adjusted logistic regression. Data presented as n/N(%) unless otherwise indicated. Final model was significant (Prob > Chi-square = 0.0087).

Table 5. Thinness and overweight among the school pupils and related risk factors

Variables	Thinness			Overweight/obesity		
	n/N(%)	RR (95%CI)	P-value	n/N(%)	$\beta$ (95%CI)	P-value
School meal						
Yes	2/113(1.770)	Ref.		4/113(3.54)		
No	16/304(5.26)	3.8(0.8-18.0)	0.083	19/3.4(6.25)	1.8(0.6-6.0)	0.306
Sex						
Female	9/211(4.27)	1.1(0.4-2.9)	0.859	11/211(5.21)	1.2(0.5-2.8)	0.685
Male	9/206(4.37)	Ref.		12/206(5.83)		
Location						
Rural	9/291(3.09)	0.6(0.2-1.9)	0.424	14/291(4.81)	0.8(0.3-2.0)	0.572
Urban	8/126(6.35)	Ref.		9/126(7.14)	Ref.	
Age of pupils (years)						
3-5	1/78(1.28)	0.4(0.02-6.0)	0.512	5/78(6.41)	1.8(0.3-13.0)	0.539
6-12	17/339(5.01)	Ref.		18/339(5.31)	Ref.	
Guardian's occupation						
Formal	1/22(4.55)	1.1(0.1-11.0)	0.913	2/22(9.09)	2.1(0.4-12.0)	0.392
Petty trader	8/135(5.93)	1.3(0.4-4.7)	0.650	8/135(5.93)	1.4(0.4-4.4)	0.685
Unemployed	3/52(5.77)	2.0(0.4-11.0)	0.422	3/52(5.77)	1.4(0.3-6.7)	0.663
Artisan	1/46(2.17)	0.5(0.1-4.3)	0.497	4/46(8.70)	1.8(0.5-7.4)	0.398
Farmer	6/162(3.70)	Ref.		6/162(3.70)	Ref.	
Takes fruit $\geq$ 3 times per week						
Yes	5/81(6.17)	1.0(0.3-3.5)	0.960	4/81(4.94)	0.7(0.2-2.3)	0.551
No	13/336(3.87)	Ref.		19/336(5.65)	Ref.	
Takes breakfast before school						
Yes	16/394(4.06)	Ref.		21/394(5.33)	Ref.	
No	2/23(8.70)	2.2(0.4-11.5)	0.355	2/23(8.70)	1.6(0.3-8.1)	0.565
Class group						
Pre-school	1/112(0.89)	0.5(0.1-4.2)	0.532	6/112(5.36)	0.4(0.1-2.8)	0.376
Class 1-3	8/158(5.06)	0.9(0.3-2.6)	0.857	6/158(3.80)	0.5(0.2-1.4)	0.164
Class 4-6	9/147(6.12)	Ref.		11/147(7.48)	Ref.	

The logistic regression analysis presented in Table 4 shows that pupils in the Lipke sub-district had the highest rate of stunting (17.0%) followed by Alavanyo sub-district (16.7%). Pupils attending schools in Lolobi sub-district had decrease odds for stunting compared to those attending school in Lipke sub-district (AOR; 0.1, 95% CI; 0.02-0.6,  $p=0.009$ ). Besides this, pupils residing in rural areas were 5 folds more likely to be stunted compare to those in urban areas (AOR=5.3, 95% CI; 1.3-21.6,  $p=0.021$ ). Furthermore, there was high proportion of stunting among boys (11.7%) as against girls (8.1%). Also, stunting in older pupils (6-12 years) was high (11.0%) compared to younger ones (3-5years) (5.1%). However, the differences in the level of stunting observed among boys and girls and among older and young children were not statistically significant.

The prevalence of thinness (4.3%) and obesity (5.5%) recorded were generally similar to what is expected in a normal population. However, obesity was high among pupils attending schools in urban areas (7.1%) and among pupils in upper class (7.5%) compared to those attending schools in rural areas (4.8%) and in the lower primary (3.8%) respectively. There was no statistically significant association between the various explanatory variables and thinness or obesity (Table 5).

#### 4. Discussion

The purpose of this study was to assess effects of provision of school meals on the nutritional status of pupils enrolled in schools with and without school feeding programme. The key findings of the study were that there was high proportion of underweight (15.6%). Further, pupils attending schools with and without school feeding programme had different proportions of underweight (12.4% vs. 16.8%) and stunting (13.3% vs. 8.6%). More to the point, pupils attending schools without school feeding programme were observed to have significantly high mean height-for-age z-scores compared to those attending schools with school feeding programme. High proportion of underweight was also observed in pupils attending schools in rural communities (16.5%) as against those in urban areas (13.5%).

Besides this, pupils residing in rural areas were about five folds more likely to be stunted compare to those residing in urban areas. It was also observed that pupils in lower primary had increased odds for underweight compared to those in the upper primary. Among the children enrolled in the two categories of schools, there were no statistically significant differences in the nutritional status indicators assessed in this study. Participation in the school-feeding programme was not statistical significant determinant of underweight, stunting, thinness and overweight levels.

The overall proportion of underweight observed in the present study is higher than the prevalence reported at the national level. According to Ghana Demographic and Health Survey (DHS), prevalence of malnutrition differs from one geographical area to another. However, the prevalence of underweight observed in this study is higher compared with what the DHS reported for children less than 5 years in 2014 [37] at the national level and in the

Volta region of Ghana where this study was conducted. Perhaps there are still pockets of hunger in the municipality where the study took place more especially among rural inhabitants. This notwithstanding reports have indicated that during the past six years, prevalence of stunting, underweight and wasting have reduced in Ghana [2,3].

In general, the proportion of stunting and thinness were however low in the present study compared to other studies conducted in Ghana and elsewhere among school age children. For example, Appiah and Laar [32] in 2014 found the proportion of wasting and stunting to be 19.4% and 50.3% respectively in the Nkwanta South District of the Volta Region. Similarly, in 2013, over 40% of stunting and 20% of wasting were observed among school children in rural Ethiopia [38].

Studies conducted to evaluate the impact of provision of school foods on nutritional status have shown positive [23,35] but more often, less conclusive [4,8,26] outcomes relating to effects of the programme on the prevalence of under nutrition among participating and non-participating school children. In the study conducted by Abizari in Ghana [31], although there were no significant differences in stunting, underweight and thinness levels among participants and non-participants, mean probability of adequacy of micronutrients evaluated was significantly higher among children enrolled in SFP schools.

These findings are consistent with the findings from the present study, which found no statistical significant difference in nutritional status indicators (underweight, stunting, thinness and overweight) between pupils attending schools with and without school feeding although differences were observed between the two groups in the prevalence of the various indicators. The widespread poor quality of school meals served [15,16,36] could be a possible cause of minimal contribution of school meals to the growth of beneficiaries.

On the contrary the proportion of underweight was high among pupils attending schools without school feeding programme compared to those in schools with school feeding programme. This is in conformity with other studies in Ghana, which reported better nutritional status among children attending schools with school feeding programme compared to those in schools without school feeding programme [4,32].

In addition to this, rural-urban differences in underweight and stunting were also observed. The study showed that there was high proportion of underweight among pupils attending schools in rural areas compared to urban areas. Further, pupils in rural areas were five folds more likely to be stunted as compared to those in the urban areas. This finding is in agreement with the findings of the Ghana demographic and Health survey in children under-five years, which show higher proportion of underweight among rural children compared to those in urban areas [37]. Another study in Ethiopia [38] also found high proportion of malnutrition among rural school children compared to their urban counterparts.

The better nutritional status of pupils in urban communities in the present study is also in conformity with those of other studies among school children in Nigeria [39] and other developing countries. The differences observed might be due to differences in the

socio-economic status of the parents [34]. In addition, the usual higher prevalent rates of intestinal parasites especially among rural children compared with urban dwellers and the likelihood of inadequate food intake in the rural areas could contribute to the disparity in the nutritional status between the children in both communities [40].

Moreover, there was a high proportion of overweight among pupils attending schools in urban areas compared to those in rural areas. This finding seemed to follow the same patterns as adult over-nutrition in Ghana, which is higher among urban population than rural population [41]. This could be due to the changes in life style, diet, urbanization, and reduced active commuting to school, use of energy saving devices and increasing sedentary games such as computer games and television watching that creates an 'obesogenic' environment [42].

Pupils in lower primary, usually between the ages of 6 to 9 years, were more prone to being underweight. This finding is in line with other studies conducted in other developing countries. For example a study in India showed that underweight and stunting was high among children in the age groups of 5-6 years while stunting was high in children between the ages of 6-8 years [43]. Unlike findings from Appiah and Laar [32], neither sex of child nor age was a predictor for malnourishment.

The possibility of a longitudinal study design providing an in-depth outcome on impact of the Ghana school feeding programme in the Hohoe municipality cannot be ruled out. The absence of a baseline data also made it impossible to compare present nutritional status indicators with what pertained at the inception of the programme. This would have given a better perspective on the impact of the programme. Nonetheless, the comparative component of the study design still provides some useful insights about impact of the feeding programmes on school children's anthropometry.

## 5. Conclusion

On the whole, the study did not show any statistical significant difference in the nutritional status indicators (underweight, stunting, thinness and overweight) between children attending schools with school feeding programmes and those in schools without school feeding programmes. Nonetheless, there were higher rates in some of the indices such as thinness and underweight among pupils in schools where the feeding programme was non-existent. Therefore, findings from this study has provided to a large extent some evidence to prove that although there may not be significant differences in the anthropometric indicators of children participating and not participating in school feeding programmes, enrolment of children in schools where they are served school meals may make marginal contributions towards improving their nutritional status.

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## Authors Note

P. Atito and F. Agbozo designed the study. P. Atito did data collection and entry. A. Abubakari and F. Agbozo analyzed the data and drafted the paper.

## Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## List of Abbreviations

SFP - school feeding programme  
GSFP - Ghana school-feeding programme.

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