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Nutritional quality and diversity in Ghana's school feeding programme: a mixed-methods exploration through caterer interviews in the Greater Accra Region

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Abstract

Background The Ghana School Feeding Programme (GSFP) provides public primary school pupils with a free daily meal. Each meal is expected to follow set menus, providing 30% of children's' (6-12 years) energy requirements. This study assessed the nutritional quality and diversity of planned and provided GSFP meals, engaging school caterers to identify how meal quality in the Greater Accra Region could be enhanced.

Methods A cross-sectional mixed methods study design was used. Multistage sampling was used to select 129 schools implementing the GSFP in six districts of the Greater Accra Region. GSFP district menus were collected as well as a one-week school caterer recall of provided school meals. The meal served on the day of data collection was recorded and photographed. Nutritional quality was evaluated based on nutrient profiling methods: energy density (low<125kcal/100g; medium 125-225kcal/100g; high>225kcal/100g) and nutrient density (low<5%; medium 5-10%; high>10%). Meal diversity was assessed by a simple count composed of 5 food groups: cereals, pulses/nuts/seeds, animal-source, vegetables and fruits. Caterers' views on programme facilitators and barriers were also explored.

Results Planned menus included 14-20 weekly options, composed of eight minimally processed traditional dishes. All meals, except white rice, had a high nutrient density/100g. Energy density was varied (low, *n*=2; medium, *n*=2; high, *n*=4). Meals included only 2/5 or 3/5 food groups, mainly starchy staples, pulses/nuts/seeds, and sometimes vegetables. Fruit was never reported. About half of caterers (51.1%) reported deviating from the planned menus: 11.7% served alternative meals, with some including animal-sourced food (17.0%), and 39.4% repeated meals provided during the week, often based on starchy staples, influencing overall nutritional quality. Most caterers reported food item cost and lack of food purchase guidelines as barriers to providing school meals, while food safety training and guidelines for food preparation were facilitators.

Conclusions While school meals are composed of minimally processed, nutrient dense, local foods**,** there are notable gaps in meal diversity and compliance, as reflected in provided meals. Caterer compliance to planned menus varied greatly, reflecting recent food price inflation. Upwardly adjusting the current meal allocation of 1.2 cedis (0.22USD) per child per day could enhance access to more affordable, nutritious and diverse foods in school meals.

Keywords School meal programmes, Food procurement, Ghana, Nutritional quality, Food provision, School caterers

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Introduction

The Republic of Ghana faces a complex public health challenge due to multiple and often coexisting burdens of malnutrition including undernutrition, micronutrient deficiencies and overweight/obesity. Estimates among children and adolescents (5-18 years) in Ghana report a high prevalence of thinness (boys 9.0%, girls 3.2%) and a concerning prevalence of overweight (boys 6.3%, girls 15.1%) [1]. As poor diet is one of the major contributors to malnutrition, improving access to healthy (nutritious and safe) food and reduced access to unhealthy diets among children is urgently needed [2, 3]. Population-based interventions in the school food environment have the potential to make the largest impact on nutritional well-being, as children and adolescents spend significant amounts of time at school and frequently eat meals and snacks in this setting.

Globally, school meal programmes (SMPs) are gaining traction. In 2022, an estimated 418 million children in 176 countries received a school meal, consisting of breakfast, lunch, snacks and/or take-home rations [4]. Increased investment and national programme ownership demonstrates a growing interest and importance of SMPs as a social good. The Ghana School Feeding Programme (GFSP) was launched in 2005 as part of the government's effort to create a national social safety net to combat poverty, hunger and malnutrition and to boost national food production [5]. The GSFP aims to provide a nutritionally adequate daily meal to all primary and kindergarten children in participating schools [5]. In 2015, the GFSP was enacted into Ghanaian law as the *National School Feeding Policy*, with policy rollout currently ongoing. Today, the GSFP continues to expand, with coverage reaching over 2.5 million primary school pupils [4]. To deliver school meals, the GSFP uses a third party-decentralised procurement model, where a school caterer is responsible for: selecting, purchasing, preparing, transporting and distributing the school meal [6]. In this model, meal guidelines, in the form of a 5-day menu, are shared by the government at the district level (i.e., second-level administrative subdivision) to participating schools and their respective caterers [5].

International recommendations and national directives increasingly include nutrition criteria or targeted standards, as research suggests that by providing nutritious and diverse meals, SMPs can enhance the dietary quality and nutritional security of school children [7, 8]. As childhood and adolescence represent key stages of growth and development, providing nutrient rich meals, as well as the adoption of healthy dietary practices, is crucial [9, 10]. The GSFP aims to provide 30% of energy requirements for primary school children (6-12 years), following an internationally established recommended dietary allowance (RDA), with meals composed of: 150g of cereals, 40g of legumes and 10g of vegetable oil; approximately 760 kilocalories [6, 11]. However, challenges to providing nutritionally adequate and diverse school meals remain. At the start of the GSFP (2006-2007), an impact analysis reported that GSFP meals served followed RDA guidelines [12], yet five studies conducted since 2012 concluded that energy and nutrient requirements were not met in sampled meals [13–17]. Moreover, nutritional recommendations, ingredients and portion size are not monitored in routine evaluations and there is a lack of clear definitions in GSFP guidelines, allowing for diverse interpretations [15, 18]. Ghana's first food based dietary guidelines, with specific provisions for Ghanaian children, were established in 2023, making appropriate portion size and nutrient content difficult to measure systematically until recently [19, 20].

Taking a closer look at not only the recommendations, but also the actors responsible for food procurement, such as the school caterer, is thus timely [21, 22]. This study assessed the nutritional quality and diversity of planned and provided GSFP meals, engaging school caterers to identify how meal quality in the Greater Accra Region could be enhanced.

Materials and methods

Study setting

The Greater Accra region was purposely selected, from the country's' sixteen regions, as it is the most populated (5,455,690 million people) and urbanized (91.7%) region of Ghana [23]. The Great Accra Region has 29 districts, each governed by a local district assembly. In addition, the Greater Accra Region hosts the headquarters for the GSFP Secretariat and over 4,000 participating GSFP schools.

Study design

A cross-sectional mixed-methods study design was used. This study was part of the larger MEALS4NCDs project, which aimed to measure and support public sector actions to create healthy food environments and prevent obesity and non-communicable diseases among children and adolescents (5-18y) in Ghana [24]. The overall design of the MEALS4NCDS project is published elsewhere [24].

Sampling and study population

A multi-stage sampling approach was used to select public primary schools to participate in this study. First, six administrative districts in the Greater Accra region were purposely selected to include a sample of varied urbanicity and poverty indicators (PI): low PI: Accra Metropolitan, La-Nkwantanang Municipal; medium

PI: Ashaiman Municipal, Kpone Katamanso District; high PI: Ga South Municipal, Ningo-Prampram District [26]. Second, schools were sampled using a proportional probability for the number of schools in each district. A detailed account of the sampling method is published elsewhere [27]. A total of 129 GSFP schools were eligible. School caterers and/or cooks, in each selected school, were invited to participate in this study. Eligible participants included caterers and cooks, adults >18 years, who held a contract with the GSFP in one of the selected districts.

Ethical approval and consent to participate

Ethical approval for the MEALS4NCDS project was granted by the Ethics Review Committee of the Humanities, University of Ghana (Approval # ECH 152-18-19), and the Ghana Health Service Ethical Review Committee (Approval # GHS-ERC 005-06-19). All participants provided informed consented to participate in this study.

Data collection

Field staff were trained during a two-day workshop. They were experienced data collection officers conversant in English and local languages (i.e., Dangme, Ga, Ewe, Twi). The interview guide was programmed onto tablets and administered using the Open Data Kit Collect (Version 2021.2.1). Caterers were individually interviewed from March to April 2021. Participant responses were captured and uploaded directly/in real-time onto a secured server managed by the project team. The food provision module [25] of the International Network for Food and Obesity/NCDs Research Monitoring and Action Support (INFORMAS) guided development of the research tools used in this project, including the School Caterer Interview Guide [24]. The interview guide was composed of eleven closed-ended quantitative questions and seven open-ended follow-up qualitative questions to gain deeper understanding of caterers' awareness and compliance to applied nutrition standards/guidelines. During data collection, caterers were asked to recall all school meals served for the past week. They were also asked what meal would be served on the day of data collection. If the meal was not already served, the research assistant photographed the meal. The caterer was also asked to provide a copy of the district school menu to be photographed. Included questions aimed to assess guidelines/instructions to purchase and prepare school meals as well as opinions related to the cost and quantity of provided meals to meet the nutritional needs of each child. Sociodemographic information, such as: age, gender, education, duration of GSFP employment and career in food service was also collected. Official weekly reports of food provided were neither available nor included in the data collection. However, school menus, set for the entire school year, from selected districts were available from the GSFP National Secretariat and used to triangulate the data collection as these menus are expected to be followed.

Data management and analysis

Three steps were used to conduct the analysis. First, a nutrient profiling model database, created during the Drivers of Food Choice project in Ghana [28] was used to assess the nutritional quality of planned and provided school meals using estimations for nutrient density and energy density. The project compiled data from six food composition tables (2012;2016 West African Food Composition Table, 2008 Tanzania Food Composition Table, 2018 Kenya Food Composition Table, 7th edition of the McCance Widdowson UK Food Composition Table (for missing data, particularly on total sugar) and the RIING database (a project in Ghana) [28]. Nutritional information available for 100g estimations for each food item and mixed-dish (e.g., a meal commonly served) was used. School meals were categorised by energy density, using the World Cancer Research Fund International cut off points (low<125kcal/100g; medium 125-225kcal/100g; high>225kcal/100g). This model also used a nutrient density score, NR11.3 (11 nutrients to encourage: protein, fibre, vitamins A, C, E and iron, calcium, potassium, magnesium, folate and zinc; 3 nutrients to limit: saturated fat, added sugars, sodium) to characterise the nutrient density of each included food [29, 30]. The USDA dietary recommendations for % daily value (%dv) of each of the nutrients per 100kcal and %dv was capped per 100kcal for positive nutrients to encourage and negative nutrients to limit. Nutrient density was calculated by subtracting the sum of nutrients to limit from the sum of nutrients to encourage (NR11.3) and then classified by their respective nutrient density based on the NRI score: low<5%; high>10%; a comprehensive description of this method is available elsewhere [28, 30]. While 10% cut-offs are widely used [30], a third category, of medium nutrient density (5-10%) was added to better represent the range of nutrient density of foods in Ghana [28]. Data on portion sizes of food served and food consumed were neither collected nor included in this analysis.

A second step compared data from district menus and the one-week recall of meals provided to school children to assess the diversity of planned and of provided school meals (all potential combinations for each day were considered). A simple 5-food group score, inspired by the ALL-5 diet quality indicator and an existing school meal quality indicator in Denmark, was used [31, 32]. Each food group was scored from 0 (food group not served) to 5 (all five food groups served). A score of 5/5 indicated

that at least one vegetable, fruit, pulse/nut/seed, animal-source food, and starchy staple were planned/provided to children. These 5-food groups are recommended for daily consumption in national food-based dietary guidelines worldwide, including in Ghana [19].

Finally, seven qualitative questions were coded using emergent themes derived from the data, leading to thematic analysis. Data coding and synthesis was conducted in Microsoft Excel.

Results

Sample characteristics

School catering staff were predominately female (96.1%), aged 40-60 years (60.4%) (Table 1). Most caterers worked in 1-5 primary schools, contracted primarily by the GSFP National Secretariat (79.1%), with tenures spanning 1-5 years (94.6%). Caterers reported receiving training in food preparation and nutrition by government ministries. At the time of data collection (2021), school caterers received 1 cedi (0.08 USD) per child/per day.

Nutritional quality and diversity of planned GSFP school meals

School menus were collected from district assemblies (n=5) and caterers who had a copy available at the time of the interview (n=11) (Supplementary File 1). All district menus featured combinations of eight minimally processed traditional meals: Banku, beans, Gari, Jollof rice or white rice, Konkonte, Waakye and/or yam (Table 2). District menus included 14 to 20 different meal options per week, resulting in numerous meal combinations (Table 4).

Nutrient density was high for all planned school meals, with the exception of meals based on white rice (Table 3). For example, Waakye scored high in nutrient density (> 10%) due to high protein content, rich in micronutrients and poor in saturated fat, sugar and salt. Energy density was more varied (low, n=2; medium, n = 2; high, n = 4). Overall meal diversity of planned meals remained low (Table 4). None of the planned meals adhered to the minimal dietary guidelines as no meal provided the five required food groups; no meal included animal-sourced food or fruit. Almost all planned meals (n=17) were composed of 2/5 recommended food groups (n=13), mostly starchy staples, such as: cassava, corn, rice and yam. Starchy staples were accompanied by a soup or a stew made with pulses/nuts/seeds (groundnut or palmnut) or vegetable (cabbage, cocoyam leaves, okra, onion, peppers or tomato). However, as ingredients varied between kitchens, only three of the planned meals specifically listed 3/5 food groups: starchy staples, pulses/nuts/seeds and vegetables.

Table 1 Characteristics of schools and school caterers interviewed

Category	Caterers interviewed (n=129) n (%)
School Districts	
Accra Metropolitan	31 (24.0)
Ashaiman Municipal	8 (6.2)
Ga South Municipal	35 (27.1)
Kpone Katamanso District	22 (17.1)
La-Nkwantanang Municipal	21 (16.3)
Ningo-Prampram District	12 (9.3)
Sex	
Female	124 (96.1)
Male	5 (3.9)
Age (Range 20-60+ years)	
20-29	9 (7.0)
30-39	29 (22.5)
40-49	39 (30.2)
50-59	39 (30.2)
60+	13 (10.1)
Level of education completed	
No formal education	4 (3.1)
Primary School	12 (9.3)
Junior High School (JHS)	48 (37.2)
Secondary High School (SHS)	32 (24.8)
Tertiary	24 (18.6)
Vocational (Catering)	9 (7.0)
Role of person interviewed	
Caterer (contract holder)	89 (69.0)
Cook (sub-contracted, hired by caterer)	40 (31.0)
Length of time working in the GFSP (years)	
1-5	122 (94.6)
6-10	5 (3.9)
10+	2 (1.5)
Caterer contracted by	
District assembly (i.e., second-level administrative subdivision)	21 (16.3)
GSFP secretariat	102 (79.0)
Other (e.g., caterer holding the primary contract)	6 (4.7)
Number of schools served per caterer	
1	104 (80.6)
2	20 (15.5)
3+	5 (3.9)
Reported prior food and/or nutrition training	
Yes	111 (86.0)
No	18 (14.0)
Food and/or nutrition training provider	**(n = 111)**
GSFP secretariat	83 (64.3)
District assembly	21 (16.3)
Catering/Vocational School	4 (3.1)
Ghana Education Services	3 (2.3)

Table 2 Planned dishes on school menus and common ingredients

Planned dishes on school menu	Common ingredients
Ampesi	Yam, boiled
Banku	Corn dough, cassava dough, boiled
Beans	Black-eyed peas, boiled
Rice/ Omo tuo	White rice, boiled
Gari	Cassava, grated and roasted
Gari foto	Cassava, grated and roasted, tomato sauce/stew
Jollof rice	White rice, boiled, tomato sauce/stew
Konkonte	Cassava flour
Waakye	White rice, boiled, beans (black-eyed peas or cow beans), boiled red sorghum leaves
Soups and stews[a]	
Garden Egg stew	Yellow eggplant/aubergine, tomato, pepper, onion, oil
Groundnut soup	Peanut paste, tomato, pepper, onion, oil
Okra soup/stew	Okra, tomato, pepper, onion, oil
Palava sauce/Kontomire stew	Cocoyam leaves, tomato, pepper, onion, red oil
Palmnut soup	Palmnut pulp, tomatoes, pepper, onion, oil
Shito (black)	Tomato, shito pepper, onions, oil, chili powder, fish power
Tomato Stew	Tomato, pepper, onions, oil, chili powder

[a] Soups and stews are accompanied by an animal-based protein source, such as goat, chicken, fish or fish powder, however, this was not frequently reported in school menus

Nutritional quality and diversity of school meals served: caterer compliance

This section summarises school meals that school caterers reported providing during the data collection week (Table 4) and on the day of data collection (Table 5); data for comparison in Ga South were not available. Around half (48.9%) of caterers reported serving the district menu (Supplementary File 2). An additional 37 caterers (39.4%) followed the planned menu, but repeated meals (i.e., a meal was served at least twice during the school week), which could negatively impact overall nutritional quality of school meals as the most commonly repeated meal, rice and stew (n = 9), was low in both energy and nutrient density. Banku (n=7), the second most commonly repeated dish, scored medium energy density. Alternative meals were served by 11 caterers (11.7%). These meals included Gari Foto, Kenkey, noodles, plantain, soya beans and white rice with beans. Nutrient density for seven of these meals was high, but energy density was mixed (low, n=2; medium n=4, high, n=1) (n.b., Gari Foto and soya beans were not included in this list as data on the nutritional composition was not available) (Supplementary File 3;4). Some caterers (17.0%) reported including animal source foods (i.e., egg, fish, meat), at least once during the school week. A few caterers (n=4) reported including animal source foods more than once per week. Some caterers (n=7) also reported serving soya beans or soya powder as an additional protein source. However, no meals scored 5/5 food groups. Meal diversity was reduced when menu items such as leafy vegetable stew were skipped for options with more carbohydrates, but increased with the inclusion of more vegetables, soya or animal-sourced food.

More specifically, meals served on the day of data collection were mostly composed of starchy staples and vegetables with either pulses/nuts/seeds (n=4) or an additional source of protein (egg, fish, meat, soya) (n=19) (Table 5). Among the sampled schools, 47 (51.1%) served a meal with 3/5 food groups followed by 41 (44.6%) schools serving 2/5 food groups. Only one (1.0%) school provided 1/5 food group and three (3.3%) schools provided 4/5 food groups (a detailed list of specific meals provided is available in Supplementary File 5).

Caterers' perspectives: barriers and facilitators to providing nutritious school meals

Interviews conducted with school caterers (n=129) identified several barriers and facilitators to providing nutritious school meals. The lack of guidelines for food preparation and limited ability to purchase food items were discussed by 98 caterers. Many caterers (n=45) specifically mentioned that the allocated meal budget of 1.00 cedi (0.08 USD) per child/per day was insufficient to cook a nutritious meal: "*The cost per plate in order to meet the nutritional standard for kids is approximately 2.50 [cedi] but we're paid 1.00 [cedi], which is bad*" [Caterer, Kpone Katamanso]. Affordability was a noted challenge, especially for nutrition-rich foods, like vegetables; "*The cost of vegetables and protein food is expensive nowadays and so I find it difficult to purchase more of it taking into consideration the amount we are being paid*" [Caterer, Kpone-Kantamanso]. High food prices were also linked with substituted meal options: *"Food stuff is expensive [...] we sometimes cook what we have without following the menu"* [Caterer, Accra Metropolitan]. Furthermore, two-thirds (n=82) of caterers linked inadequate meal quantity to delayed GSFP payments: *"The cost is not sufficient. Thus, we are running at a loss in the feeding programme. Moreover, funds are not released in time to help cater for the cooking of meals"* [Caterer, Ningo-Prampram]. A caterer described adding additional money from their personal reserves to try to provide more food for the students: *"The quantity the kids desire to have is always not*

Table 3 Energy density and nutrient density of components of planned dishes of school menus

School meal components	Energy Density for 100g[a]	Nutrient Density for 100g
Banku		
Groundnut soup		
Okra stew		
Palmnut soup		
Beans with palm oil		
Gari		
Yam		
Garden egg stew		
Jollof rice		
Tomato sauce/stew		
Shito		
Konkonte		
White rice		
Kontomere stew (Palavar sauce)		
Cabbage stew		
Waakye		

[a] We used 100 gram(g) estimations for each food item and mixed-dish (i.e., the average estimated portion size for a meal commonly served with multiple ingredients). Food items were categorised by energy density (red=low<125kcal/100g; yellow=medium 125-225kcal/100g; green=high>225kcal/100g) and nutrient density (low<5%; medium 5-10%; high>10%). Nutrient density profile for okra soup unavailable. No data for Soy bean or Gari Foto. Data were available for 5/6 districts.

like that because of the very small amount given from the authorities due to the calculation they have done. So, we have to add our own money to sometimes make the kids feel okay" [Caterer, Kpone-Kantamanso].

Food preparation guidelines for school meals were widely unavailable. The majority of caterers (*n*=91) reported that they did not receive guidelines. Caterers who received guidelines (*n*=38) were instructed on food safety and personal hygiene, portion size (e.g., 6-7 cups of rice per 200 students), food temperature at the time of service and general guidance to follow the planned school menu. Caterers reported that they were somewhat compliant (*n*=2), mostly compliant (*n*=13) or fully compliant (*n*=23) with these guidelines. Despite stated challenges, caterers reported high compliance for overall school meal provision, which could be explained by the high numbers of additional meals served.

Facilitators included guidelines for food purchase and existing food safety knowledge and/or prior training. Caterers frequently reported receiving guidelines on what food should be included in school meals (*n*=67). Specific guidelines included: limiting unhealthy foods (e.g., excess oil, salt and bouillon cubes) (*n*=7), increasing vegetable quantity (*n*=10), cooking good quality/healthy food that was fresh/not spoiled (*n*=13) and purchasing local foods (*n*=4). Around half of caterers (*n*=67) reported high levels of compliance with these instructions (fully or somewhat compliant). Food purchasing guidelines could also be interpreted as an obstacle to providing nutritious meals, as the remaining caterers (*n*=62) reported receiving unclear guidelines. School caterers also took steps to ensure the 'healthiness' of the food/beverages provided in school meals, with nine caterers linking the definition of healthiness to good nutrition: *"I make sure each meal contains vitamins, protein and energy giving nutrients in the right proportion"* [Caterer, Accra Metropolitan]. Moreover, 'healthiness' was ensured via caterer hygiene (*n*=81) and food safety (*n*= 87) practices. Personal hygiene practices included: handwashing before meal preparation, covering hair, removing jewelry, wearing face coverings and receiving a medical exam to be cleared as fit for work. Food safety practices spanned food purchase (e.g., buying fresh food), food storage (e.g., food refrigeration), food preparation (e.g., using clean water to wash food before cooking, covering food to avoid pests, cooking in clean/neat/tidy kitchens and surrounding environments), food transportation (e.g., using sealed storage containers to keep the school meal at a hot temperature) and meal distribution (e.g., serving food in a clean environment, using clean utensils). Participants provided detailed understanding and utilisation of these practices: *"I keep the cooking surrounding neat, always maintain personal hygiene by taking a shower before cooking and serving [...] keeping food in ice chests to avoid flies from contaminating them [...] I wash hand regularly with soap before and after handling food"* [Caterer, Accra Metropolitan].

Table 4 Comparison of meal diversity, using the 5-food group score, of planned and provided school meals over a one-week period in five districts

All 5-Score[a]	Number of planned meals	List of all planned meals options for a one-week period	Number of provided meals	List of all provided meals reported by caterers (n=94) over a one-week period	
				Planned meals	Additional meals
0/5					
1/5	1	Gari foto	1		Beans with red oil
2/5	13	Banku with Groundnut, Banku with okra soup/stew, Banku with palmnut soup, Beans with gari, Beans with yam, Jollof rice, Rice with Kontomere stew (Palavar sauce), Rice with Tomato stew, Omo tuo with groundnut soup, Omo tuo with okro soup/stew, Omo tuo with palmnut soup, Yam with Garden egg stew, Yam with Kontomere stew (Palavar sauce)	20	Banku with Groundnut, Banku with okra soup/stew, Banku with palmnut soup, Beans with gari, Jollof rice, Omo tuo with groundnut soup, Omo tuo with palmnut soup, Rice with Tomato stew, Yam with Kontomere stew	Banku with gravy stew, Beans with gari and plantain, Dawa dawa (beans with red oil), Gari with soup (not specified), Gari with groundnut soup, Jollof rice with vegetables, Konkonte with groundnut soup, Omo tuo with soup (not specified), Rice and beans, Spaghetti, Spaghetti jollof
3/5	3	Rice with leafy vegetable stew (cabbage) and soya, Waakye with tomato stew, Waakye with tomato stew and shito	13	Waakye with tomato stew, Waakye with tomato stew and shito	Banku with palmnut soup and fish, Banku with okro stew and chicken, Fried Rice with gizzards, Jollof Rice with chicken, Jollof Rice with meat (not specified), Jollof Rice with soya, Rice and stew with fish, Rice with vegetables and egg, Spaghetti with sausage, Waakye with stew and gari, Waakye with stew and salad
4/5	0		4		Waakye with stew and fish, Waakye with shito and fish, Waakye with shito and egg, Waakye with stew and chicken
5/5					

[a] The 5-food group score indicated that at least one vegetable, fruit, pulse/nut/seed, animal-source food, and starchy staple were planned for the school meal. Each of the five food groups was scored from 0 (food group not served) to 5 (all five food groups served). These 5 food groups are recommended for daily consumption in national food-based dietary guidelines worldwide, including in Ghana and were inspired by the ALL-5 diet quality indicator and the Meal Index of Dietary Quality of school lunches [31, 32]. Data available for 5/6 districts (not available for Ga South).

Table 5 Diversity of meals provided on the day of data collection using the 5-food group score

All 5-Score[a]	Total number of schools (n=92[a]) providing each food group category on the day of data collection as reported by caterer n (%)
0/5	
1/5	1 (1.0)
2/5	41 (44.6)
3/5	47 (51.1)
4/5	3 (3.3)
5/5	

[a] Two schools sampled did not report the meal served on the day of data collection.

Discussion

This study highlights critical findings regarding the nutritional quality, meal diversity, and implementation challenges of the GSFP. Meals typically have high nutrient density, varied quality of energy density and low diversity. Further, the views of 129 caterers provided insights on challenges and facilitators to providing healthy school meals. Most caterers reported barriers (e.g., food item cost) and facilitators (e.g., food safety training) to providing school meals.

Serving nutritious school meals to meet increased nutrient requirements for growth and development represents a widespread challenge in Ghana and globally [9]. While GSFP menus were created to ensure that caterers have flexibility to account for food availability, local procurement and seasonality, the overall meal diversity in school children's diets remains low, with starchy staples and pulses/nuts/seeds served most frequently. In addition, caterer's compliance varied greatly, questioning the feasibility of uniformly implementing nutritious meals in the region. For example, the nutritional quality of meals decreased when lower nutrient dense meals based on starchy staples (e.g., white rice or Banku) were repeated during the week, and/or increased if animal food sources (e.g., meat and fish) were added. Varied sources of protein, such as beans, soya, egg, fish and meat were offered, but overall inclusion remained extremely low, or with unsignificant quantities (e.g., fish powder). Increasing protein content, both plant and animal-based sources [33] could positively impact nutritional status and overall health, especially as protein deficiencies in these age groups are linked with poor growth and delayed puberty [10]. As beans are a staple on the district menus, prioritising their incorporation into dishes that children enjoy, such as Waakye, can encourage protein intake and promote local and climate friendly food options. Increasing inclusion of vegetables could also improve nutritional quality and create more opportunities for local food procurement with smallholder farmers, potentially reducing food cost. As few meal quality indexes have been developed for school meals, and even fewer validated in LMICs, using an unvalidated tool is a study limitation [34]. While calculating dietary diversity at the meal level is not common, a reference period of 24h is frequently used. It is important to note that the evaluation of the school lunch represents one meal consumed per day, totalling five days per week, and may not necessarily reflect overall dietary quality. Recall and/or social desirability bias was limited by recording and photographing the meal served on the day of data collection, however these biases could still be present in the one-week recall.

While GSFP caterers are paid employees, the amount allocated per student per meal appears inadequate to purchase ingredients, let alone to earn a salary, with some caterers using their own financial reserves to provide school meals. This challenge was reflected in the nation-wide strike of school caterers (April 27 - June 22, 2023), where increased allocations per student (3.00 cedis, 0.22 USD) were requested to help overcome high food price inflation (59.3% in 2022) [35]. The strike ended with an increase in allocated budget per student/per day from 1.00 cedi (0.072 USD) to 1.20 cedis (0.089 USD). The GSFP and district assemblies can use these findings alongside standards set by the 2023 Food based dietary guidelines for Ghana as a tool to revise school menus, working alongside caterers, to overcome challenges to promote access to optimal nutrient rich diets that are diverse, culturally relevant and ideally, locally procured. Thus reducing all burdens of malnutrition in school-aged children, spurring local economies and promoting climate friendly initiatives [19, 33]. The Minister of Gender and the School Feeding Secretariat also agreed to engage with school caterers to better understand their challenges, a first step in acknowledging the key role caterers play within the GSFP [36]. This is increasingly important as the GSFP continues to expand programme coverage in primary schools and begins to scale up to secondary schools.

Despite Ghana's clear commitment to a successful national programme, the government does not publish national survey data and has abstained from participating in a recent global school meals survey [37], furthering challenges monitoring and evaluation efforts. While global trends suggest that 60% of special training for school cooks and caterers covers food safety and hygiene [8], additional subjects such as nutrition, menu planning and portions/measurement are only included in about 40% of national programming [8]. This may reflect why caterers in this study discussed food safety knowledge and practices more often than nutritional knowledge.

This barrier could be minimised by the creation and implementation of tools to facilitate data collection on dietary recall and portion sizes in school meals, both in Ghana and similar contexts [33]. For example, the School Meals Planner tool, piloted in Ghana in 2012, can be used by the government and school caterers to plan out school meals that meet minimum nutritional requirements and 30% RDA recommendations within allocated budgets [38]. Additional tools, such as the Food Recognition Assistance and Nudging Insights (FRANI), use artificial intelligence for food recognition and portion estimation to conduct dietary assessment in Ghanaian adolescent girls, which could be applied for widescale nutritional quality monitoring and evaluation of school meals [39]. However, these tools should only be used if they facilitate implementation and evaluation without further complicating or overburdening programme coordinators and staff with additional responsibilities.

On policy and practice, the discrepancy between the planned menus and provided meals points to a need for interventions that enhance the compliance of school meal provision and enforcement mechanisms. Given the cost constraints, and a lack of clear procurement guidelines, Ghana's current effort to develop a public food procurement and service policy may address this. Clearer food purchasing guidelines could help standardize meal quality across the programme. These guidelines should be realistic, reflecting local market conditions and seasonal availability, to ensure that they are practical and applicable across diverse districts. Furthermore, increasing the meal allocation beyond the current 1.2 Ghana cedis per child/per day could mitigate the financial barriers that prevent caterers from adhering to menu guidelines and enable them to include a wider variety of food groups, particularly fruits and animal-sourced foods, which are currently lacking. Earmarking GSFP meal allocation to the recently introduced sugar sweetened beverage taxes could be a potential path forward. Enhanced training for caterers, focusing on nutritional guidelines and cost-effective meal planning, could also improve compliance when coupled with regular monitoring, caterer involvement and financial support to ensure that the knowledge gained is effectively implemented.

The study also highlights the need for further research into the operational challenges and behavioural aspects of GSFP implementation. Such studies may include qualitative research involving focus groups with caterers, teachers, and parents to provide deeper insights into SMP stakeholders' perception and the political, economic, cultural and social factors influencing meal provisioning. Investigating the challenges associated with incorporating locally sourced, cost-effective food items could also provide valuable data to support more sustainable and community-supported food systems, embodying homegrown school feeding programme ideals within the GSFP.

Conclusion

While planned GSFP menus comprise minimally processed local dishes, there are notable gaps in meal diversity and compliance by caterers, as reflected in the provided meals. The GSFP has laudable nutrition objectives, however without ongoing monitoring of weekly meals served or access to official records, it is difficult to determine the nutritional quality and impact of school meals. This has implications for the nutritional outcomes of the programme and for providing opportunities to enhance policy and implementation. The GSFP can be further strengthened by improved reporting, clearer programme guidelines and increased training for caterers. In addition, delays in payments could be addressed by scheduling payment dates in advance. Meal allocation budgets could be adjusted to reflect increased food prices and caterers' salaries. Taking these actions could ensure that GSFP meals are easily accessible and affordable to school caterers and nutritious and safe for children.

Abbreviations

GSFP	Ghana School Feeding Programme
PI	Poverty indicator
RDA	Recommended dietary allowance
SMPs	School Meal Programmes

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

A.L. and M.H. contributed to the research design and protocol development. G.S.A. led data management throughout the data collection period and cleaned the data. J.L. and G.S.A. analysed the data overseen by A.L., M.H. and M.S. J.L. wrote the first draft of the paper. All authors reviewed the manuscript and approved the final version.

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Availability of data and materials

The full interview guide and data used in this paper is available upon request to info@meals4ncds.org.

Declarations

Ethics approval and consent to participate

Ethics approval for this study was granted by the Ghana Health Service Ethics Review Committee (Approval # GHS-ERC 005-06-19) and the University of Ghana Ethics Committee for Humanities (Approval # ECH 152-18-19). Study participants were adults >18 years. All participants provided informed consent to participate in this study.

Consent for publication

Participants gave informed consent for the publication of research findings.

Competing interests

The authors declare no competing interests.

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