

# School Feeding and the Challenge of Supporting Nutritional Needs of Pupils in Ghana

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## ABSTRACT

*The Ghana free school feeding program was implemented to diminish short-term hunger and malnutrition among elementary school children, to increase school enrolment, attendance, and retention in primary schools and to boost domestic food production through patronizing local agricultural food production by small-scale farmers. This research sought to examine the nutritional diversity of the school-served meals and their ability to support the nutritional needs of the pupils. The research study was carried out at the New Juaben Municipality, Koforidua, Ghana. Four deprived elementary schools enrolled in the school feeding program in the New Juaben North District in Ghana were selected; the population consisted of pupils who were between the ages of 6 to 15 years. The survey data were collected through interviews and personal observations. The data on the nutritional diversity of foods were determined through the menu and food ingredients used in each meal preparation, these were compared with the standard nutritional composition. To evaluate the established objectives on pupils' nutrition support from the school feeding program, tables were designed, with individual menus from each school, food groups, and the assessment of nutrients comprised in each local food item. The study outcome revealed the school's cyclical menus had selected foods stuff that comprised of all the nutrients needed for a healthy life to support school children's nutritional needs.*

## Keywords

Nutrition, Vitamins, Minerals,

## Introduction

Malnutrition is a public health concern. Poor health and nutrition among school-going children reduces their mental development through physiological changes and lowering their ability to part take in learning experiences., [1]. Malnutrition occurs when bodily required nutrients are not supplied to the cells to support their optimum functions [2]. Dietary habits such as excessive calorie consumption, fewer micronutrients (vitamins and minerals) intake, and ineffective metabolism with required intakes result in malnutrition [3]. Malnutrition is also the involuntary loss of weight greater than 10% correlated with the concentration of blood serum albumin < 3.5g/dL [4]. Over or undernutrition results from excess or inadequate consumption of nutrients (macro and

micro-nutrients). Overnutrition manifestation results in avoidable chronic diseases such as obesity, metabolic disorders, type 2 diabetes, cardiovascular diseases; conversely, undernutrition occur due to inadequate dietary intakes [5]. Nutritional imbalances outcomes include Protein-Energy Malnutrition (PEM) and various mineral and vitamins (micronutrient) deficiencies; vitamin A, iron iodine zinc, folate deficiencies, etc. that impairs vitality, developments, and productivity; [6,7]. Infant malnutrition is an essential food insecurity indicator, which is common in low resource setting communities and developing countries and has increased steadily from 27 percent in the 1970s to greater than 33 percent in 2004, and rising silently since 2014 [8]. Braun, 2005, asserted hunger and malnutrition could linger on for over 42 million infants in developing countries by 2025: [9]. Research indicates protein-energy malnutrition and short-term hunger are prevalent amongst school children (pupils), [10]. World Health

Organization assessments suggest malnutrition accounts for fifty-four (54) percent of worldwide infant death. Even minor degrees of malnutrition double the possibility of mortality through respiratory and diarrhetic illnesses, the prospect increases in acute incidents of malnutrition [7].

Pupils who are malnourished are likely to be stunted during adulthood, have lower educational accomplishment and economic status, and may probably procreate stunted infants, [11]. School children who experience malnutrition during the ages essential for rapid growth and development can result in long-lasting effects on their health, [12]. It is estimated that 241 million pupils are deficient in iodine while 1.5 billion people are at risk, moreover, 57 million iodine deficiency is observed among African schoolchildren, [13-15]. Deficiencies of nutrients such as iodine, vitamin A and iron among children could result in acute respiratory diseases and other infections, these are persistent due to vitamin A deficiencies, [16]. The number of pupils suffering from iron deficiency anemia is still greater, estimating 305 million worldwide; [17]. Besides, the rates of malnutrition are higher among female pupils than in males, and this is evident at the national level [18,19], however, the differences between undernutrition frequency rates between young boys and girls are generally minimum, [18]. In other developing regions, the nutritional status of girls is higher. Slightly undernutrition in pupils impairs children's intellectual development and exploratory behavior, [20]. Several different nutrition disorders may arise, depending on which nutrients are under or overabundant in the diet, as well as developing large quantities of pupil's meal from a single food source; [21].

This study seeks to (1) examine the nutritional composition of a pupil's lunch (meal) and (2) ascertain whether the nutritional target objectives set in the school feeding program are being met.

### **Overview of the School Feeding Program**

The term school feeding has been used severally over the years to imply the provision of hot lunches or snacks at school to reduce children's hunger during the school day. Some continue to define school feeding as in-school meals only. School feeding represents a varied and comprehensive set of uses of food for the achievement of educational outcomes, [22].

United Nations hunger task force in collaboration with NEPAD (New Partnership for Africa development) formulated the principles and rules of government for homegrown school feeding program in 2003 in Ghana. Several school feeding programs have already been implemented in Ghana; the country is one of the ten countries in sub-Saharan Africa realizing the school feeding program demonstrated to the principles of the New Partnership for Africa Development (NEPAD). The program intended to serve about 1.04 million children in all 138 districts of Ghana. Focusing largely on the deprived areas, which has a high poverty tendency, with most of the districts confronted with malnutrition challenges, [22,23].

The long-term aims of the Ghana School Feeding Program are to reduce poverty and food insecurity also to increase school

enrolment, attention, and retention. The School Feeding Program depends on locally grown food products, which promotes domestic food production and improves market access for resourceful local farmers, thereby increasing the employment and income level of farmers at the community and national level. This was to be achieved alongside meeting the core needs of the pupils which is to gain nutritional benefits from the meals they consume. The school meals must therefore be prepared from food sources that provide the key nutrients, which comprises protein, fat, carbohydrates, vitamins, mineral salts, and water. School feeding effectively enables hundreds of millions of poor children worldwide to attend schools in both developed and developing countries alike, [22,23].

### **Importance of the school feeding programs**

The school feeding program has several advantages, in addition to it enabling education, it impacts positive benefits relating to several other developmental goals which include gender equity, poverty/hunger reduction, partnerships and cooperation, and improvements in health and other social indicators. Even in the most-developed nations, school children can be supported with school meals. Research studies indicate millions of school children (pupils) have benefited from school feeding in Finland, Japan, and the United States, [22].

School feeding programs throughout the world have successfully attracted poor children to school and retained them by offering products they may probably not get elsewhere such as hot foods or nourishing snacks. School-based feeding programs have proven effective in encouraging enrolment, increasing attention spans, and improving attendance at school; [24].

### **Sampling Procedure and Study Area**

A purposive sampling method was used for the study which selected respondents of interest who could provide the needed information the researcher required for the study. The data collection was conducted through interviewing and observational study.

The study was done in Koforidua, the eastern regional capital of Ghana. The researcher contacted the Ghana Education Service (GES) in the new Juaben north municipality for the list and locations of the deprived elementary schools in the New Juabeng municipality that are enrolled in the Ghana school feeding program (GSFP). This information was used to select four deprived primary schools in the municipality. These schools were only selected if they were enrolled in the program for at least six months and if the school is willing to part take in the study. The total sample data was 100 which included eighty (80) pupils, that is twenty (20) pupils from each elementary school identified and four (4) team cooks as well from every institution, summing to twenty (20) for the four chosen schools, that participated in the study.

### **Demographic data of study group (Cooks and Pupils)**

#### **Cooks**

All the employees (cooks) 100% for the study were females with 0% males. This draws the perception that most females are employed as cooks for the food production services contracts in most elementary schools' feeding programs. The majority (70%) of

the cooks were aged between 30-49 representing a larger number of the population of the employees, while 20 % were aged between 25-30, 10 % were between age 50 and above. The age distribution of the employees shows that most of the cooks from the schools are in their prime ages since most of the works at the kitchen is manually done more energetic employees are required to handle such difficult tasks. Most of the cooks (80%) had their education at vocational training institutions while a minority, representing 20% had tertiary education.

### Pupils

The majority of the pupils (70 %) for the study were between the age range of 11-15, while 30 % of the pupils of the study were aged between 6-10 years since the study was conducted in an elementary school which admits most of their average pupils from age six to fifteen or beyond.

Most (50) of the pupils, that is 62.5% were girls and 30 representing 37.5% were boys since the schools selected for the study had more female pupils in attendance than males.

There was a fair representation of pupils from each stage of the classes which ranged was from class one to class six. From the study plan and data, 8 pupils, representing 10% are pupils in class one, with the same number, 8 pupils, being 10% selected from class two respectively, 12 pupils representing 15% were selected from class three, 16 representing 20% were from class four, 16 pupils representing 20% were also from class five. Finally, 20 representing 25% of pupils were chosen from class six, constituting the majority of respondents since they were older and can provide accurate information.

### Demographic data of target group Characteristics of participants

Characteristics	Number	Percent (%)
<i>Sex of cooks</i>		
Female	20	100
Male	0	0
<i>Age of cooks</i>		
50-59	2	10
49-30	14	70
29-19	4	20
<i>Education of cooks</i>		
Vocational	16	80
Tertiary	4	20
<i>Sex, age, class of pupils</i>		
<i>Sex of pupils</i>		
Female	50	62.5
Male	30	37.5
<i>Age of pupils</i>		
6-10	56	70
11-15	24	30
<i>Class (stage) of pupils</i>		
One	8	10
Two	8	10
Three	12	15
Four	16	20
Five	16	20
Six	20	25

### Food Menu and Nutritional Composition

Meeting nutrition standards are part of the set goals for school meals along with quantities of foods and nutrients that the meals must provide. Presently, institutions either use standards related to a food-based menu planning method or a set of standards that focuses on a nutrient-based menu planning method. Each of these standards comprises the quantities of food items to be included in the menu planning method. According to the USDA, a set of meal standards are nutrients standard menu planning. School meals should meet the applicable references of dietary guidelines. Regulations expect school meals to provide recommended dietary allowances of food calories, protein, vitamin A, vitamin C, iron, and calcium. School meals should meet general nutrition requirements, nonetheless, decisions on precise foods to serve and their preparation are made by local institutions authorities.

Table 1 shows the cyclical menus of four elementary schools in the New Juabeng municipality, Koforidua, that provides school meals for pupils, and figure 1 shows the food groups. The table describes cyclical menus for five days of the week, the food groups of the individual dishes, and their corresponding nutrients compositions.

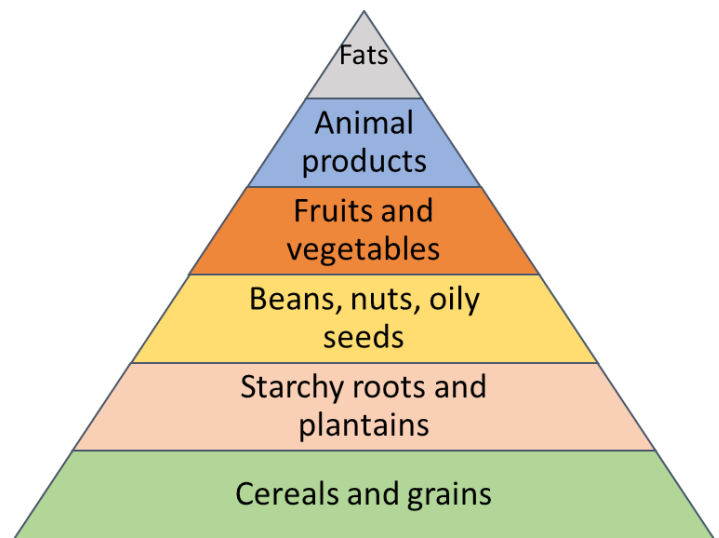


Figure 1: Food groups for the school feeding program.

### Results and Discussions

Table 1 shows an overview of the weekly school meals consumed in the four primary schools by the pupils. Generally, there was a repetition of local menus across the four elementary schools selected. All the main dishes included animal products constituting total protein incorporations in the meals. The main dishes had staple foods such as gari (cassava dish), banku, and kenkey (made from maize), as well as beans and rice, these foodstuffs were chosen from starchy roots and plantains, beans, nuts, and oilseeds, then cereals and grains. These food products sources provide the human body with carbohydrates, vitamins, minerals, and salts. All the stews (tomato gravies) used in complementing the main starchy dishes were prepared from an oil base, with onions, and tomatoes either fresh and or canned. The food products for the tomato gravies were largely from fruits and vegetables, which

**Table 1:** Cyclical menu of four schools for the school feeding program in the New Juabeng Municipality.

School	Days	Local Meal	Food Description	Food Group	Primary Nutrients
A	Monday	Beans, Gari	Soft boiled beans, mixed with tomato gravy with gari (made from cassava) as an accompaniment	1. Beans, nuts, and oilseeds 2. Starchy roots and plantain 3. Fruits and Vegetables 4. Fats and Oils	Protein Carbohydrates Fat and Oil Minerals Vitamins
	Tuesday	Tuna flakes, Banku, Okro stew	Banku is made from fermented corn dough, goes with okra, vegetables, and fish gravy	1. Animal Products 2. Fruits and Vegetables. 3. Grains and cereals	Protein Vitamins Carbohydrates Minerals
	Wednesday	Tuna flakes, Rice, Tomato Gravy	Tomato, vegetables, and fish sauce with plain boiled rice as an accompaniment.	1. Animal Products 2. Grains and Cereals 3. Fruits and Vegetables 4. Fat and Oil	Protein Vitamins Carbohydrates Fat
	Thursday	Agushie/herrings, Rice, Palava Sauce	Spinach, tomatoes, and melon seed gravy constitutes the palava sauce, with plain boiled rice	1. Grains and cereals 2. Animal products 3. Beans, nuts, and oilseeds 4. Fruits and vegetables 5. Fat and Oil	Protein Carbohydrates Minerals Vitamins Fat
	Friday	Tuna, Banku, Groundnut Soup	Tuna peanut butter soup with soft boiled rice portioned into balls.	1. Animal Protein 2. Grains and cereals 3. Beans, Nuts, and Oilseeds 4. Fruit and Vegetables	Protein Carbohydrates Fat Minerals Vitamins
B	Monday	Beans, Gari	Soft boiled beans, mixed with tomato gravy with gari (made from cassava) as accompaniment.	1. Beans, nuts, and oilseeds 2. Starchy roots and plantain 3. Fruits and Vegetables 4. Fats and Oils	Protein Carbohydrates Fat and Oil Minerals Vitamins
	Tuesday	Tuna Flakes/Soya, Rice, Palava Sauce	Spinach, tomatoes, and melon seed gravy creates the palava sauce however soya bean was added to this menu, with plain boiled rice as an accompaniment	1. Grains and cereals 2. Animal products 3. Beans, nuts, and oilseeds 4. Fruits and vegetables 5. Fat and Oil	Protein Carbohydrates Minerals Vitamins Fat
	Wednesday	Herrings, Beef, Banku, Palm-nut Soup	Banku made from fermented corn and cassava dough with palm fruit (pulp), vegetables, and fish soup	1. Animal Products 2. Starchy roots and Plantain 3. Fruits and Vegetables	Protein Carbohydrates Vitamins
	Thursday	Tuna, Waakye, Tomato Gravy	Waakye prepared from boiled rice and beans with tomato gravy.	1. Animal Products 2. Grains and Cereals 3. Fruits and Vegetables 4. Fats and Oil	Protein Carbohydrates Vitamins Fat and Oil
	Friday	Tuna, Banku, Okro Stew	Banku prepared from corn and cassava dough with okra, vegetables, and fish gravy	1. Animal Products 2. Grains and Cereals 3. Fruits and Vegetables 4. Fat and Oil	Protein Carbohydrates Vitamins Fats
C	Monday	Tuna Flakes, Rice, Palava Sauce	Spinach, tomatoes, and melon seed gravy constitutes the palava sauce, with plain boiled rice as a complement	1. Animal Products 2. Grains and cereal 3. Fruits and Vegetables 4. Beans, Nuts, and Oilseeds	Protein Vitamins Carbohydrates Fats
	Tuesday	Tuna, Banku, Palm-nut soup	Banku made from corn and cassava dough with palm fruit (pulp), vegetables, and fish soup	1. Animal Products 2. Starchy roots and plantain 3. Beans, Nuts, and oilseeds 4. Grains and Cereals	Protein Vitamins Carbohydrates Fats
	Wednesday	Beans, Gari	Soft boiled beans, mixed with tomato gravy with gari (made from cassava) as accompaniment.	1. Grains and Cereals 2. Starchy roots and Plantain 3. Fruits and Vegetables 4. Fats and Oil	Protein Vitamins Fats Carbohydrates
	Thursday	Herrings, Banku, Tomato Gravy	Banku prepared from fermented corn and cassava with tomatoes, vegetables, and fish sauce	1. Animal Products 2. Starchy roots and Plantain 3. Fruits and Vegetables 4. Fats and Oil	Protein Vitamins Carbohydrates Fats
	Friday	Tuna, Waakye, Tomato Sauce	Waakye made from boiled rice and beans with tomato sauce.	1. Animal Products 2. Cereals and Grains 3. Fruits and Vegetables 4. Beans, Nuts, and Oilseeds	Protein Cereals and grains Vitamins Carbohydrates Fats

D	Monday	Beans, Gari	Soft boiled beans, mixed with tomato gravy with gari (made from cassava) as accompaniment.	1.Grains and Cereals 2.Starchy roots and Plantain 3. Fruits and Vegetables 4.Fats and Oil	Protein Carbohydrates Vitamins Fats
	Tuesday	Tuna Flakes, Kenkey, Palava sauce	Kenkey made from fermented corn dough with kontomire (spinach), the sauce that contains tomato and stewed melon seeds	1.Animal Products 2.Cereals and grains 3.Fruits and Vegetables	Protein Vitamins Carbohydrates Fats
	Wednesday	Tuna, Rice balls, Groundnut soup	Tuna peanut butter soup with soft boiled rice portioned into balls	1.Animal Products 2.Cereals and grains 3.Beans, Nuts, and Oilseeds 4.Fruits and Vegetables	Protein Vitamins Carbohydrates Fats
	Thursday	Tuna, Rice, Palava Sauce	Spinach, tomatoes, and melon seed gravy constitutes the palava sauce, with plain boiled rice	1.Animal Products 2.Cereals and grains 3.Fruits and vegetables 4. Fat and oil	Protein Carbohydrates Vitamins Fats
	Friday	Tuna, Banku, Okro Stew	Banku is made from corn flour with okra, vegetables, and fish gravy	1.Animal Products 2.Starchy roots and plantain 3.Fruits and Vegetables 4.Cereals and Grains	Protein Carbohydrates Vitamins Fats

contains and provides vitamins and minerals. When the stews (tomato gravies), were made into palava sauce as indicated on the cyclical menu, a fourth and fifth ingredient is added to the gravy, that is kontomire (spinach) which is usually from green leafy vegetables and milled melon seeds that provides micro and macro minerals and vitamins. It was interesting to observe that, one of the schools added soya bean chunks to their palava sauce, this makes the food more nutritious as soybean is rich in protein and other key nutrients. Two soups were commonly present on the menus from all the schools, which are groundnut/peanut soup and palm nut (palm fruit) soup, which were often eaten with carbohydrates that's banku. The majority of the school meals use tuna fish, which is an animal product and does provide the body with protein, the only drawback with tuna is the potential mercury toxicity of large fishes. The application of thermal energy (heat) to the various food commodities during cooking, mostly boiling could potentially destroy some of the key nutrients. All selected schools providing meals through the school feeding programs for pupils greatly supported the nutritional needs of the pupils by carefully selecting food crops from food groups that partly meet the nutritional needs of the pupils. This goes a long way to supplement the other foods consumed by the pupils outside the school hours hence enhancing their nutrition requirements.

However, mostly, cereals and grains (non-heme) and starchy roots and plantain were used for the preparation of the foods which had mineral contents such as iron that may not be readily bioavailable due to the phytate contents from the cereals and grains. Therefore, more non-heme food absorption enhancers such as food sources that contain ascorbic acids (vitamin C) must be incorporated in the menu or given as desserts to the pupils. The provision of the school meals is to support other meals consumed from home.

### Conclusion

The role of the school feeding program is to alleviate short-term hunger during school sessions, and in low resource communities, it is expected that the school meal partly supports the nutritional

needs of the pupils. The research study examined the nutritional diversity of pupil's meals for the national school feeding program at four deprived schools at the new Juabeng Municipality, Koforidua, Ghana. The study found that the ingredients for the school meal were selected from different food groups that consisted of beans, nuts, and oily seeds, starchy roots, and plantain, fruits, and vegetables, fats and oils, cereals, and grains with the various food sources containing and meeting the body with proteins, vitamins, carbohydrates, minerals and, fats. Currently, the cyclical menu and meals used by the different elementary schools selected contain all the nutrients from the main food sources of nutrients which support the schools' pupil's nutritional needs except that most of their main foods' sources were from cereals and grains (non-heme foods) and starchy roots and plantains which provides mainly carbohydrates. Enhancement of the cereals and grains' micromineral (iron) absorption with the addition of more food crops containing ascorbic acid is essential to minimize infant and adolescent malnutrition in developing regions for a healthy life.

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### References

1. El-Kassas G, F. Ziade. The Dual Burden of Malnutrition and Associated Dietary and Lifestyle Habits among Lebanese School Age Children Living in Orphanages in North Lebanon. *J Nutr Metab.* 2017; 4863431.
2. Alemu EA, W. Leal Filho. Malnutrition and Its Implications on Food Security, in *Zero Hunger*, Editors. Springer International Publishing: Cham. 2019; 1-10.
3. Mathur P, R Pillai. Overnutrition: Current scenario combat strategies. *Indian Journal of Medical Research.* 2019; 149: 695-705.
4. Keller U. Nutritional Laboratory Markers in Malnutrition.

- Journal of Clinical Medicine. 2019; 8: 775.
5. Francesca Mastorci, Cristina Vassalle, Kyriazoula Chatzianagnostou, et al. Undernutrition and Overnutrition Burden for Diseases in Developing Countries: The Role of Oxidative Stress Biomarkers to Assess Disease Risk and Interventional Strategies. *Antioxidants*. 2017; 6: 41.
  6. Unicef/MI, Micronutrient Deficiencies. 2006.
  7. WHO, Malnutrition. 2019.
  8. FAO, Micronutrients. 2020.
  9. Von Braun J. The food crisis isn't over. *Nature*. 2008; 456: 701.
  10. Development, P.f.C., Undernutrition - Short Term Hunger. 1998.
  11. Robert E Black, Lindsay H Allen, Zulfiqar A Bhutta, et al. Maternal and child undernutrition: global and regional exposures and health consequences. *The lancet*. 2008; 371: 243-260.
  12. Bailey R. Physical Education and Sport in Schools: A Review of Benefits and Outcomes. *Journal of School Health*. 2006; 76: 397-401.
  13. Frances E Aboud, Karim Bougma, Tizita Lemma, et al. Evaluation of the effects of iodized salt on the mental development of preschool-aged children: a cluster randomized trial in northern Ethiopia. *Maternal & Child Nutrition*. 2017; 13: e12322.
  14. Z Wolde-Gebriel, CE West, H Gebru, et al. Interrelationship between vitamin A, iodine and iron status in schoolchildren in Shoa Region, Central Ethiopia. *British Journal of Nutrition*. 1993; 70: 593-607.
  15. Sintayehu Hailu, Mamo Wubshet, Haile Woldie, et al. Iodine deficiency and associated factors among school children: a cross-sectional study in Ethiopia. *Archives of Public Health*. 2016; 74: 46.
  16. Hui Sun, Riki Kawaguchi. *The Membrane Receptor for Plasma Retinol-Binding Protein, A New Type of Cell-Surface Receptor*. Elsevier. 2011; 288: 1-41.
  17. Zegeye Getaneh, Bamlaku Enawgaw, Getabalew Engidaye, et al. Prevalence of anemia and associated factors among school children in Gondar town public primary schools, northwest Ethiopia: A school-based cross-sectional study. *PLOS ONE*. 2017; 12: e0190151.
  18. Rajesh Kunwar, PB Pillai. Impact of Education of Parents on Nutritional Status of Primary School Children. *Medical Journal Armed Forces India*. 2002; 58: 38-43.
  19. Wubet Taklual, Sewunet Baye, Maru Mekie, et al. Double Burden of Malnutrition among Female Adolescent Students in Bahir Dar City, Amhara, Ethiopia. *BioMed Research International*. 2020: 10.
  20. Vinicius J. B. Martins, Telma M. M. Toledo Florêncio, Luciane P. Grillo, et al. Long-Lasting Effects of Undernutrition. *International Journal of Environmental Research and Public Health*. 2011; 8: 1817-1846.
  21. Cesar G Victora, Linda Adair, Caroline Fall, et al. Maternal and child undernutrition: consequences for adult health and human capital. *The Lancet*. 2008; 371: 340-357.
  22. WFP, School Feeding Program. 2004.
  23. UN, School Feeding Program. 2005.
  24. International Food Policy, School Feeding Program in Developing Countries. 2005.