

Measuring Nutritional Intake of Adolescents in Ghana, West Africa

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Abstract

With 85% of the world's adolescent populations residing in developing countries, it is important to monitor and track their nutrition status and habits. The purpose of this study, conducted in Ghana, was to provide results from a nutrition intake and eating habits questionnaire which was modified from the Youth Risk Behavior Survey. Questions were tested for cultural appropriateness by Ghanaian Subject Matter Experts. The 26 item questionnaire (the GNRBS) was administered to 140 students in four senior secondary boarding schools in Ghana. Classes of students were randomly selected from the schools. The average age of the students was 16 years. Females and males were represented fairly equally (52% & 48%, respectively). The Ghanaian adolescents consumed an average 3 servings of fruit, 2 servings of vegetables, and 3.4 servings of milk each week. They also consumed candy and soda (snack consumption) 2.4 times per week and fried foods 4.8 times per week. This study also showed that nutritionally adequate foods were available in boarding school dining halls and Ghana's adolescents made food choices that may be detrimental to their health.

Key words: Nutrition, Surveillance, Adolescence, Food Frequency Questionnaire, Ghana, Youth Nutrition Status

Introduction

In industrialized and developing countries throughout the world, nutritional problems are the source of many chronic diseases that afflict individuals later in life.¹ During adolescence, individuals achieve the final 15-20% of their height, gain 50% of their adult body weight, and accumulate up to 45% of their skeletal mass.² The adolescent years are also a time when most people develop and exhibit certain health risk behaviors including poor nutritional habits which may persist into adulthood.³ Surveillance systems in developed countries such as the Youth Risk Behavior Surveillance Survey (YRBSS) use sample surveys to monitor and track the behaviors of youth and serve to predict future health patterns and diseases.⁴ Currently, 85% of the world's adolescent populations live in developing countries, yet because of lack of adequate research, there is a gap in nutritional behavior for this important population segment. That is, less is known about the nutritional habits of adolescents in developing countries.⁵ Through the STEPwise approach to Risk Factor Surveillance (STEPS), the World Health Organization's (WHO) is working on bridging the data gap.⁶ As part of the STEPS program, WHO initiated development of the Global School-Based Health Survey (GSHS) with technical assistance from the US Centers for Disease Control and Prevention (CDC) in 2001.⁷ The GSHS will help fill the gap in health data as it relates to adolescent health behavior in developing countries. However, to date, only 13 of the 42 countries in Africa have initiated GSHS activities⁸. Of the 13 countries, three have completed GSHS activities and submitted final reports. It should be noted that as a follow-up to this study, the authors have initiated GSHS activities in Ghana with scheduled data collection in the summer of 2007.

Health Indicators for Adolescents in Ghana

Ghana is a developing country in West Africa with a population of 22.1 million.⁹ The published age distribution in 2005 divides the population into two categories, 0 to 14 years and 15 to 64 years, and approximately 40% of the population is under 15 years of age.¹⁰ Unlike most African countries, Ghana has enjoyed the benefits of an economic resurgence with a Gross Domestic Product growth rate of 5.8% in 2004.¹¹ In a recent analysis of data collected by WHO and UNESCO stunted economic growth in developing countries was highly associated with lack of nutrition and education.¹² The researchers estimate that the loss of human potential to be associated with more than a 20% deficit in adult

income. It is important to monitor the health risk behaviors of Ghana's future labor force, especially adolescents. Currently, there are two national level health behavior assessment instruments that focus on HIV/AIDS and tobacco use.^{13, 14} However, other important health behaviors relating to drugs and alcohol, sanitation, nutrition, physical activity, mental health, and protective factors are not monitored. Only nutritional behavior will be the focus of this paper.

Several factors may account for the lack of nutritional behavior data on this important segment of Ghana's population. The most obvious is the lack of appropriate assessment instruments. Food frequency questionnaires (FFQ) are the instruments of choice for epidemiological research.¹⁵⁻¹⁷ However, FFQs must be determined to be culturally appropriate, reliable, and valid prior to their use in a specific population.¹⁸⁻²¹ Some items on the YRBS have been transferred to instruments such as the Global School Health Survey (GSHS).²² However, the GSHS is meant to serve as a template that must be modified to be considered relevant and valid for adolescents in various countries and cultures. This acculturation and validation is done by modifying parts of, or adding to, the three modules of the GSHS template. The modules are; Core Modules, Core Expanded questions, and Country Specific questions.²³

Purpose of the Study

The purpose of this study was to assess the nutritional intake of male and female adolescent students who attend both rural and urban schools in the Greater Accra and Eastern regions of Ghana. Foods available to students represent a selection of foods available in these two regions. The food frequency questionnaire used in this study included new and modified nutritional intake items from the YRBS. This questionnaire was determined to be culturally appropriate by Subject Matter Experts (SMEs) in Ghana.

Methods

Two urban and two rural schools were randomly selected from the population of all 60 senior secondary schools within the Greater Accra and Eastern regions of Ghana. One second-year class was randomly selected from each school; second-year students have had at least one health related class that included nutrition as a topic of study. Class sizes ranged from 27 to 43, and a total of 140 students participated in the four schools. Based on total school enrollment information provided by officials from

Ghana Education Service (GES), the sample was representative of the senior secondary school population in the region.

Survey Instrument

The study instrument was a 26 item questionnaire designed to assess nutritional risk behaviors among senior secondary school students. The questionnaire was developed based on eight items selected from the YRBS that were modified to be culturally appropriate for senior secondary school students in this region of Ghana. The questionnaire was titled the Ghana Nutrition Risk Behavior Survey (GNRBS). Four of the 26 items requested the participant to provide demographic information. Additional items addressed dining hall use; frequency of carbohydrate, fruit, vegetable, protein and fat consumption; frequency of milk and water consumption; and frequency of snacks. Examples of food items on the GNRBS were modified to reflect food items unique to the geographic areas under study. An exhaustive list of available food items was developed based on information collected from interviews with students, school dining personnel and on-campus food vendors.

The GNRBS, unlike the YRBS, uses multiple questions to assess the frequency of consumption of macronutrients such as carbohydrates, protein, and fat. The essence of the questions stayed the same (as in the YRBS) for a given macro nutrient although the examples cited per macronutrient within each question are different. The rationale for multiple questions that measure the frequency of consumption of the same macronutrient was to facilitate better recall by citing food items that had something in common. Therefore, root-based carbohydrate products and derivatives such as yam, assava/kokonte/fufu, potatoes, and cocoyam were grouped together as part of one question measuring frequency of carbohydrate consumption. Gari, rice, pasta, and spaghetti were grouped together as another question measuring frequency of carbohydrate consumption.

The GNRBS was pilot tested. Pilot test involved administration of the instrument to a small number of students and evaluation by subject matter experts (SMEs). A panel of eight SMEs including dining service managers, students, a student supervisor, and a health educator reviewed the GNRBS for content and wording. The SMEs reviewed and rated each of the questions and response choices for their clarity, item choice availability at home and at school, and the choices of food items regularly selected by secondary school students. A closed-ended form was

used by the SMEs for evaluation. However, open ended responses were solicited. Cultural appropriateness of the GNRBS was also assessed by the SMEs (see Table 1).

Changes were made as a result of pilot testing. A major change was the wording on the GNRBS had been modified with a greater emphasis on the time duration for frequency of consumption. This change was based on the discovery of potential source of error within the pilot FFQ. For example, during pilot testing a large percentage (> 83%) of the respondents claimed to consume very little high carbohydrate based meals and fruit per day over a seven day period. However, the boarding schools in the pilot study provided dining hall menus for the week prior to pilot testing, showing an average of two or more high carbohydrate based meals served per day. In addition, the number of food examples on the GNRBS was expanded. Pilot testing indicated that some participants failed to count appropriate examples of specific macro nutrients because they were not listed as examples. Results from pilot test support the need for multiple questions. Multiple questions per macro nutrient allow for a larger number of food examples. The GNRBS focused on:

- 1) Items consumed over the past seven days
- 2) The number of times specific items were consumed
- 3) The number of meals that a specific item was consumed

An example of responses choices*:

- 1) I did not eat (the specific item)
- 2) 1-3 times during the past 7 days
- 3) 4-6 times during the past 7 days
- 5) 1 time per day
- 5) 2 times per day
- 3) 3 times per day
- 7) 4 or more times per day

*For analysis, ordinal answer categories were converted to interval scale

Examples of new and substitution of GNRBS item choices for YRBS items included:

YRBS	GNRBS
• snack foods	groundnuts, doughnuts, biscuits
• vegetables	<i>No Substitution</i>
• <i>Not Included</i>	meats, eggs, fish
• <i>Not Included</i>	fried donut, fried yams, fried plantains, fried turkey (chofi), fried fish

• soft drinks and artificially flavored drinks	Coca -cola, Pepsi, Fanta, lucozade, or high sugar content drinks
• potatoes	rice, waakye, Omo-Tuo, fried, gari, fufu, banku, or kenkey

The final version of the GNRBS was verified with a food diary, the Ghana Nutritional Daily Diet Record (GNDDR).²⁴ The GNDDR contained an exhaustive list of food items based on the examples cited within the GNRBS. Students were instructed to indicate the number of times they consumed a particular food item per day for a seven day period. The extent of validity (criterion) of the GNRBS was assessed by determining the extent of agreement between the GNRBS and the food diary. The reliability and validity of this instrument have been described in detail elsewhere.^{24(p33-34, 47-53)}

Instrument Administration

Informed consent was obtained from school administrators and teachers in the boarding schools engaged in the study. Participant consent was given prior to data collection. Students were not allowed to participate without consent. Within Ghana, boarding school administrators (i.e., head masters/mistresses, service personnel and teachers) are responsible for the care of students when in school. The care services include addressing health problems, control over activities students engage in, determination of when students can leave campus, and when they can receive visitors. In other words, school officials, to a large degree, are the guardians of students while on campus and their consent is required for studies in schools in lieu of required parental consent. As a further protection of minors, the Ghana Education Service (GES) mandates that all studies involving students within state funded primary and secondary institutions obtain written permission from the GES. The study protocol and consent procedures were approved by the Ghana Education Service and the University Institutional Review Board of the primary investigators. Questionnaires were administered in the classroom by trained research assistants. Students were instructed not to write their names on the questionnaire and were assigned an arbitrary ID number to protect confidentiality of responses. The questionnaire took approximately 25 minutes to complete. Once completed, students placed the questionnaires in a marked envelope which was sealed by the research assistant and delivered to the primary investigator for data entry and analysis.

Data Analysis

The data were coded and entered into EpiData.²⁵ Checks were created for each variable including appropriate range of values, missing values, and verification of logical consistency. Frequency distributions and descriptive statistics of the GNRBS were computed and tabulated using SPSS version 11.0.²⁶

Results and Implications

One hundred forty participants completed the GNRBS. The mean age of the participants was 16.1 years with a range of 14 to 18 years. Two of the four study schools were located in rural areas. The majority of the participants (92%) reported their residential background as urban. The reason for the large proportion of students with reported urban residence is because many students from urban areas attend boarding schools located in rural areas. Table 2 is a presentation of the demographic characteristics of the participants described by school, age, and gender.

Table 3 shows the descriptive statistics for the frequency of consumption of food by item categories: frequency of use of the school's dining hall; use of snacks, fried foods, and soda in past 7 days; use of fruits and vegetables; use of food high in protein; and use of foods high in carbohydrates. On average students consumed 3 servings of fruit, 2 servings of vegetables, and 3.4 servings of milk per week. Students consumed candy and soda (snacks) 2.4 times a week and they also consumed fried foods 4.8 times per week. Students were asked about dining hall use: "How often do you eat (full meal) outside of the dining hall? That is meals, bought outside of the dining hall, meals eaten from your personal provisions or meals brought to you by parents/family?" They were asked about use of snacks, "How often have you eaten snack foods such as groundnuts, doughnuts, roasted plantain, chips, biscuits, etc. during the past 7 days?" They were also asked about candy, "How often have you eaten toffee or candy during the past 7 days?"

Discussion

This study describes the assessment of nutrition intake among a group of Ghanaian adolescents using a surveillance instrument with nutrition items modified from the Youth Risk Behavior Survey to ensure cultural appropriateness. The importance of the study is reflected by the World Health Organization (WHO) initiative to help countries, especially developing ones, to adopt the low cost

Global School Health Survey (GSHS).²⁷ We compared the GNRBS to the culturally appropriate version of the 2004 GSHS²⁸ for a similar country, Nigeria. The difference between the two instruments is that the GNRBS focuses on one health risk area, nutrition. The GSHS questionnaire focuses on 10 health risk areas. It should be noted that the GNRBS was developed in 2003 and had no developmental connection to the GSHS except for the fact that both instruments, to an extent, used the YRBS as a template.

The sample for the study was selected from four senior secondary schools in the Greater Accra and Eastern region of Ghana. From interviews with students, dining personnel and on campus food vendors an exhaustive list of 81 food items available to students was created. Study results demonstrated that students consumed, on average, 3 servings of fruit per week and fewer than 2 servings of vegetables per week. They consumed milk or milk related items 3.4 times per week. For meals consumed in the dining hall, students showed that fish and foods high in carbohydrates (such as gari, kenkey, rice etc) were chosen with the greatest frequency. However, data on frequency of snack consumption showed that more candy, soda and fried foods were consumed than fruits, vegetables and salads. Results also showed students chose to eat outside of the dining hall frequently (an average of 8 times a week). During one week of assessment, students averaged 14 times of dining hall use. They ate outside the dining hall 8 times, using vendors within their school and personal provisions.

This study replaced standard food categories with regional food choices available to students. This is the same approach used by the WHO's Global School-Based Student Health Survey (GSHS). Working with WHO and CDC, the GSHS will be modified for cultural appropriateness and administered in Ghana in the summer of 2007. Lessons learned from this study have already been applied to the modification of the GSHS for administration in Ghana. The use of SMEs was crucial in addressing content and face validity of the GNRBS as it relates to cultural appropriateness. This is because SMEs are most familiar with the food items and the descriptors that students in a specific geographic region use to describe basic foods.

Conclusions and Recommendations

The importance for monitoring health risk indicators among adolescents cannot be overstated. In 2001, the WHO reported that "the dichotomy of developed versus developing countries is becoming irrelevant with increasing urbanization and globalization, particularly among adolescents".⁵ Adolescent health risk behaviors, specifically nutritional problems, are not unique to developed countries. This is supported by results from this preliminary study showed poor choices of snack foods, fried foods and other unhealthy nutritional items. To an extent, some of the basic nutritional needs of adolescents in Ghana are similar to those faced by their counterparts in developed countries.

As a result of a number of factors, adolescents in developing countries may not be able to fulfill their nutritional needs with a balanced diet, particularly during a period of development when they undergo dramatic physical, cognitive, social, and emotional changes. These factors include poverty, lack of access, lack of healthy choices, and lack of knowledge. Lack of knowledge about nutrition is important even when access, healthy food options, and poverty are not relevant issues. While the lack of adequate nutrition is cited as a major health issue in developing countries, overabundance of nutrient intake is also becoming a problem.²⁸ Obesity is now pandemic and World Health Organization data indicate that overweight and obesity are now dramatically on the rise in low and middle income countries.²⁹ This study revealed that students in Ghana are as likely to make poor nutritional choices as youth in developed countries. In addition, the study also demonstrates the need for having culturally appropriate instruments to measure nutritional intake frequency of adolescents in school settings. In the GNRBS, food choice items were identified and included country- and region-specific foods.

Several limitations of this study must be considered when interpreting the results. First, due to logistical reasons, the population of this study was derived from two geographic regions of the educational system in Ghana. There are ten regions in Ghana. A second limiting factor is that the sample represents youth who attend boarding schools. There is a distinct advantage in ascertaining nutrition data mostly from dining halls where food selection is predetermined. These students may have been provided food choices that are not readily available to youths who attend senior secondary school (SSS) but

live at home. However, according to the director for school health in Ghana, (C. Bosumtwi-Sam; Director for School Health, Ghana Education Service; oral communication; November 2006), the latter issue is tempered by the fact that approximately 80 percent of SSS are boarding schools. Finally, the data presented does not shed light on the extent to which factors such as cost, availability, or storage influences the type of food choices reported by students.

Recommendations for future studies that address nutritional needs for Ghana's adolescents include: a) a need to develop a method of surveillance for both in school and out of school youth to determine eating habits and nutrient intake; b) a need to determine the existence and the extent of the effectiveness of nutrition education in home or school settings; c) a need to expand the range of culturally appropriate nutrition surveillance instruments and education programs beyond the region of Greater Accra and eastern Ghana to the rest of the country and, d) to ensure that if and when the GSHS is acculturated for use in Ghana, the nutrition section reflects the varied diets across the country.

A significant contribution to research in nutrition of children and adolescents can be made by studying students attending boarding schools since a large proportion use the dining hall as primary eating place. The surveillance data collected can serve as a basis to develop nutrition education and intervention programs for schools. As Ghana continues to develop economically, health risk behaviors and problems found in developed countries, including sedentary life styles, proliferation of fast food choices, and poor diet are likely to increase among youth and adults.

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Table 1. Overall Content Evaluation Ratings of the GNRBS by SMEs (N = 16)

Questions	Rating (5 = maximum agreement)				<u>M</u>
	Dining services manager	Students	Student Supervisor	Health educator	
The questions are easy to understand	5.00	5.00	5.00	5.00	5.00
The answer choices relate well to the questions	5.00	4.00	4.50	5.00	4.63
There are enough related examples listed for each question	5.00	4.50	2.50	4.00	4.00
Examples of food items given are available to SSS students	4.00	2.50	4.00	4.50	3.75
SSS students can get the food items in the questionnaire in school or from home if they chose	4.50	4.00	5.00	5.00	4.63
The questions are arranged in a logical manner	3.00	4.50	3.00	5.00	3.88
The food examples given include most items that SSS students regularly eat	4.00	4.50	4.50	4.50	4.38

Table 2. Demographics of Study Participants

	<i>N</i>	<i>%</i>
GNRBS	140	100.00
Gender		
Girls	73	52.14
Boys	67	47.85
School Location		
Girls		
Rural	43	30.71
Urban	30	21.42
Boys		
Rural	40	28.57
Urban	27	19.28
Age		
14-15	23	16.43
16	84	60.00
17-18	33	23.57

Table 3. Frequency of Use of the Dining Hall

	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Use of dining hall in a week	0	21	14.47	4.43
Number of times ate outside of dining hall in a week	0	21	8.07	4.47
Number of times ate snacks in past 7 days	0	21	5.53	4.49
Number of times ate candy in past 7 days	0	18	2.07	3.81
Number of times ate fried food over past 7 days	0	19	4.76	3.39
Number of times drank soda over past 7 days	0	9	2.38	2.47
Number of times ate fruits over past 7 days	0	25	3.00	3.33
Number of times ate salad over past 7 days	0	9	0.65	1.27
Number of times ate other vegetables over past 7 days	0	6	1.68	1.38
Number of glasses of milk drunk over past 7 days	0	14	3.41	3.33
Number of times ate protein1 over past 7 days	0	6	1.34	1.30
Number of times ate protein2 over past 7 days	0	6	0.41	0.95
Number of times ate eggs over past 7 days	0	8	1.35	1.60
Number of times ate fish over past 7 days	0	10	3.94	2.44
Number of times ate carbohydrate1 over past 7 days	0	28	3.76	4.91
Number of times ate carbohydrate2 over past 7 days	0	21	0.78	2.17
Number of times ate carbohydrate3 over past 7 days	0	28	5.74	3.37
Number of times ate carbohydrate4 over past 7 days	0	28	4.13	3.87

Note:

Protein1= chicken, turkey, duck; Protein2= pork, goat, sheep, antelope, grasscutter; Carbohydrate1 = “koko”, Quaker Oats, “Tom Brown”, corn grates (rocks), ekuegbmei; Carbohydrate2 = plantains, yams, cassava or potatoes; Carbohydrate3 = rice, spaghetti or pasta; Carbohydrate4 = gari, fufu, banku or kenkey