

Where are the beans? A feasibility study to evaluate the quality of the school lunch program of Costa Rica

¿Dónde están los frijoles? Un estudio de viabilidad para evaluar la calidad del programa de almuerzos escolares de Costa Rica.

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RESUMEN

El exceso de peso corporal en niños ha aumentado drásticamente en Costa Rica, un país con un programa establecido de Alimentación y Nutrición Para Escolares y Adolescentes. Realizamos un estudio piloto de nueve días para evaluar la calidad de la dieta de la cafetería de la Escuela Central Jacó ubicada en Garabito, un cantón con un índice de desarrollo humano muy bajo. Los platos de comida de 361 escolares fueron pesados para estimar el consumo (g). Durante el período de 9 días, se incluyeron granos refinados (arroz o espagueti) todos los días, mientras que las leguminosas y ensalada se incluyeron el 78% y el 56% del tiempo. Las guarniciones que consistían principalmente de carne de res o platos mixtos con carne de res o cerdo se incluyeron el 56% del tiempo. Los granos integrales no se incluyeron en el menú. Las niñas no seleccionaron frijoles negros y ensalada el 38% y el 34% del tiempo, y los niños, el 44% y el 40% del tiempo, respectivamente. La proporción de arroz blanco a frijoles servidos entre los que eligieron estos alimentos fue de 1.57 g entre los grados de 1ero a 3ero y 1.32 g entre los grados de 4to a 6to. En resumen, los alimentos servidos en la escuela estudiada consistían principalmente en granos refinados, con muy pequeñas proporciones de leguminosas y vegetales, y una frecuencia innecesariamente alta de carne roja. Los resultados de este estudio piloto son preocupantes dados los efectos adversos ya conocidos de tales patrones dietéticos.

Palabras clave: niños, nutrición, dieta, programa de almuerzo escolar, leguminosas, adiposidad, sobrepeso. (Fuente: DeCS BIREME)

ABSTRACT

Excess body weight among children has increased dramatically in Costa Rica, a country with an established School and Adolescent Feeding and Nutrition Program. We conducted a nine-day pilot study to assess the quality of the diet served at the cafeteria in the Jacó Central School located in Garabito, a county with very low human development index. Food plates from 361 schoolchildren between 1st and 6th grade were weighted to estimate consumption (g), as the difference between the amount of food served (g) and the amount of food left in the plate (g). During the 9-day period, refined grains (rice or spaghetti) were included every day, whereas legumes and salad were included 78% and 56% of the time. Side dishes mostly consisting of beef or mixed dishes with beef or pork were included 56% of the time. Whole grains were not included in the menu. Girls chose not to have black beans and salad 38% and 34% of the time, and boys, 44% and 40% of the time, respectively. The proportion of white rice to beans served among those who chose these foods was 1.57 g among grades 1st to 3th and 1.32 g among 4th to 6th. In sum, foods served in the school studied consisted mainly of refined grains, with very small proportions of legumes and vegetables, and an unnecessarily high frequency of red meat. The results from this pilot study are worrisome given the known adverse effects of such dietary patterns on excess body weight.

Keywords: children, nutrition, diet, school lunch program, legumes, adiposity, overweight. (Source: Pubmed, clinicalkey)

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INTRODUCTION

According to the World Health Organization (WHO), non-communicable diseases (NCDs) such as cardiovascular diseases, cancer, chronic respiratory diseases and diabetes, kill around 41 million people each year.^(1,2) This corresponds to 71% of all deaths globally, and over 85% of these occur in low and middle-income countries such as Costa Rica.⁽¹⁾ Annually, 15 million people die “prematurely” from NCDs between the ages of 30 and 69 years.⁽²⁾ The combination of genetic, physiological, environmental and behavioral factors such as poor diet and bad lifestyle habits are responsible for all NCDs.⁽¹⁻³⁾ Not surprisingly, childhood obesity has increased significantly over the past few decades.^(4,5) The prevalence of overweight and obesity among children and adolescents worldwide aged 5-19 rose from 4% (11 million) in 1975 to over 18% (124 million) in 2016.⁽⁶⁾ In Costa Rica, according to the National Nutrition Survey, 12% of children were overweight and 10% were obese (using the weight/size indicator) between 2008 to 2009.⁽⁷⁾

It is clear that prevention of NCDs should start in childhood and adolescence, a crucial period for the acquisition of healthy habits and lifestyles that can be learned and maintained throughout adulthood.⁽⁸⁾ Because children spend a large portion of their time in school (second place after time spent at home),⁽⁹⁻¹³⁾ schools play an important role in obesity prevention in children.^(14,15) In Costa Rica, programs and legislations to promote and articulate institutional processes to prevent overweight and obesity have been developed.⁽¹⁶⁾ The School and Adolescent Feeding and Nutrition Program (PANEA) lead by the Ministry of Public Education, aims to provide nutritional complementary foods without any charge to students from public schools throughout the country.⁽¹⁶⁾ This program is responsible for developing a food-nutrition culture that promotes healthy eating practices, hygiene habits and proper behaviors around daily food in the educational community.⁽¹⁶⁾ Unfortunately, the menus developed and widely used in the PANEA program, predominantly include refined grains such as rice and pasta, starchy vegetables, red meats, and less than optimal amounts of legumes and vegetables.⁽¹⁷⁾ This is a major concern because the adverse health effects of such dietary patterns are very well documented.⁽¹⁸⁾

This pilot study was designed as a first step into our understanding of the role that the school lunch program could play in the prevention of weight gain

in children in Costa Rica. Specifically, the main objective was to examine the proportion of beans relative to refined grains, and vegetables given and discarded at the school dining room the Jacó Central School in the county of Garabito, Puntarenas. In Costa Rica, intake of traditional foods such as legumes, a high-protein, high-fiber, nutrient dense food rich in calcium, iron, folate, zinc and magnesium, have decreased during the last decades.⁽¹⁹⁻²³⁾ According to the EAT-Lancet commission, high intake of legumes is essential for the prevention of excess body weight and non-communicable diseases such as diabetes, hypertension and cardiovascular diseases, as well as suitable during early development.^(18,24-27)

METHODS

Study setting

The study took place at the Jacó Central School, located in a rural area of Garabito, Puntarenas, which has approximately 11,685 inhabitants.⁽²⁸⁾ Garabito, classified as one of the counties with the lowest human development index,⁽²⁹⁾ is located in a narrow coastal plain on the Costa Rican Central Pacific.⁽³⁰⁾ All schools in Garabito participate in the school lunch program of the Ministry of Public Education^(16,17) where children should receive a different menu each day. The Jacó school lunch program typically serves lunch to ~560 from 1st through 6th grade every day. Lunch is served between ~9:30 am and 1:30 pm given the small size of the dining-room. As per the school lunch protocol, every day the students are asked by the cooks to choose which foods they would want to have from those available in the menu. The cooks then serve a standard amount of the selected food items on a tray that the students then take to a table where they eat the lunch. After the lunch is eaten, the students are required to put the leftovers in a bucket and place the empty tray on a designated area on the dining room counter. The Garabito county was selected for this pilot study because given its low ranking in the human development index among the Costa Rican counties, it is likely to represent regions where lunch programs are highly needed.⁽²⁹⁾

Data collection

Research assistants visited the dining-room every day for nine consecutive school days for data collection. The amount of served food items and the amount of leftover foods was weighted from all the plates. In order to facilitate measuring the food portion sizes, special disposable plates containing 3 divisions were used during the observation period. To measure the average portion size (g) of all the food items served each day, the cooks were randomly requested to place the amount of food to be served directly on a scale before it was served on a plate. This procedure was done 3 times for each food item served on each day. The leftover food in each plate was weighted on a food scale once the food plates were placed on the counter. A picture was taken of each student's lunch plate before and after being consumed for illustration and to clarify questions that might come up during data analysis. For each group of children that entered the dining-room, research assistants noted the school-grade and the amount of time that the children spent in the dining-room. To identify plates by sex, boys and girls were instructed to leave the plates on different side of the table. A total of 10 menus were given to the students during the 9-day observation period, because two different menus were given on a same day. All the menus followed the Costa Rica school lunch program.

RESULTS

Table 1 describes the food items offered to schoolchildren from 1st to 6th grade during the observation days. Ten menus in total were evaluated. The menus included refined grains (rice or regular spaghetti) every day, whereas legumes were served 8 times, salad was served 6 times. Among foods derived from animal sources, beef and/or pork were served 5 times, mixed dishes containing fish or chicken were served 3 times, and dishes with cheese or dairy were served 1 time.

Table 2 describes the number of times that specific food items were offered during a 9-day period and the percentage of children who requested not to have a specific food item. White rice and black beans were not requested 8% and 38% of the time in girls and 21% and 44% of the time in boys, respectively. When salad was available, 34% of girls and 40% of boys did not request it. Whereas 32% (beef in sauce (14%)/mixed dishes with pork or beef (18%))-of girls and 92% ((beef in sauce (44%)/mixed

dishes with pork or beef (48%)) of boys, did not request dishes with red meat.

Table 3 shows the estimated portion weight (amount served in grams) by school grade. Children in grades 4 to 6 received 50% more rice, 70% more beans, and 10% more salad than children in grades 1 to 3. The ratio of white rice to beans served was higher (1.57) for grades 1 to 3 than for grades 4 to 6 (1.32).

Table 4 shows the estimated intake (g) and percent food discarded (%) among girls and boys who did request to have the specific foods offered. The estimated intake of white rice and black beans was higher in boys (92.2 g and 67.1 g, respectively) than in girls (80.6 g and 59.4 g, respectively). The ratio of rice to beans was 1.37 in both girls and boys. The estimated intake of salad was 46.2 g in girls and 39.1 g in boys. Boys discarded more salad than girls (30% vs 20% leftover). The lowest amount of leftover food was obtained when children were served spaghetti with tomato sauce and cheese. Figure 1 illustrates food items served (left column) versus foods discarded (right column).

DISCUSSION

We assessed the food provided and consumed at lunch in 361 schoolchildren from grades 1st to 6th who attended the Jacó Central School that participates in the PANEA school lunch program. During the 9-day observation period, the menus given at the school dining room included refined grains (white rice or spaghetti) every day, whereas legumes and salad were served 78% and 56% of the time, respectively. Black beans and salad were less likely to be selected than rice by both girls and boys; rice was not selected by girls and boys 8% and 21% of the time respectively, whereas black beans and salad were not selected by girls 38% and 34% of the time, and by boys, 44% and 40%, respectively. The estimated average food consumed at lunch consisted of 86.4 g of rice, 63.2 g of beans and 42.6 g of salad among those who selected these items. On average, 24% of the rice, 20% of the beans, and 25% of the salad were left on the plate. The estimated ratio of white rice to beans consumed was 1.37. This pilot study suggests that the food composition of the lunch offered and consumed by children in the studied school during a 9-day observation period is consistent with a dietary pattern

that promotes excess body weight and non-communicable chronic diseases.

The Jacó Central School, located in the Garabito county of the Central Pacific coast of Costa Rica was selected for the study because of the low human development index indicating that sectors such as health, education and economy are scarce.⁽³¹⁾ Lunch programs in such schools play a particular important role in the health and development of their children. The staple foods given to children in the Jacó Central School and recommended by PANEA are worrisome for several reasons. First, it does not include whole grains. The refined grains given to children, such as white rice and wheat (spaghetti) are a major source of high-glycemic carbohydrates that promote increased risk of metabolic abnormalities, weight gain, cardiovascular disease, type 2 diabetes and obesity.⁽³²⁻³⁴⁾ Substitution of white for brown rice in PANEA should be considered as a strategy to reduce weight gain in children and prevent coronary heart disease, type 2 diabetes, and overall mortality.⁽³³⁾ Second, the proportion of beans served is low, particularly because only white rice is served. Healthy sources of protein, such as legumes are associated with less weight gain and lower risk of non-communicable chronic diseases and total mortality.^(18,22) The Costa Rica Food Guidelines currently recommend a proportion of 2 tbs. of rice for 1 tbs. of beans.⁽³⁵⁾ It is clear that these recommendations need to be modified so that they are based on the best scientific evidence available to date.⁽¹⁸⁾ And third, the amount of vegetables served to the schoolchildren was very low. Current evidence-based recommendations indicate that half of the plate should contain non-starchy vegetables and fruits.⁽²⁷⁾ Low consumption of vegetables bring along a large number of health consequences in both children and adults.⁽³⁶⁾ In children, vegetable consumption is extremely important because they need the nutrients contained in these foods to ensure good growth and development as well as to avoid possible nutritional deficiencies, which may be very frequent in children.^(36,37) Studies suggest that a diet rich in vegetables in conjunction with fruits can lower blood pressure, reduce the risk of heart disease and stroke, prevent some types of cancer, lower risk of eye and digestive problems, and have a positive effect upon blood sugar.⁽³⁸⁾ Vegetables served to children should be varied and prepared in a way that is appealing to them.^(39,40) For example, undercooked vegetables and "hard" vegetables could retain more of the vitamins

and may help people eat slower but it is unlikely that children will eat them.⁽⁴⁰⁾ The vegetables offered and served during the 9-day observation period only included a salad made with cabbage, carrot, lettuce and tomato. Thus, it is not surprising that 37% of children chose not to have vegetables, and 25% of the salad was left on the plate among those who selected it. Radical changes are needed not only in the type of foods served, but also in the preparation of the dishes given to the children. Major education efforts will be required to make the school lunch program a tool to inculcate consumption of better dietary patterns in children.

The inclusion of red meat in the menu 50% of the time (or every other day) deserves special comment. Intake of red meat is a major determinant of cancer, obesity, diabetes, cardiovascular diseases, and total mortality.^(41,42) Current evidence-based recommendations indicate that meat should not be consumed at all or at the most once per week.⁽¹⁸⁾ Intake of red meat also has serious detrimental effects on the environment.⁽¹⁸⁾ For example, the amount of greenhouse gases produced with red meat consumption every other day is 1,611 kg, compared to only 284 kg for chicken, 390 kg for fish, 115 kg for eggs, and 20 kg for beans.⁽⁴³⁾ Therefore, it is clear that exposing children to red meat is not only harming their health but the planet in which they will have to live in the future.^(47,48) Furthermore, given that the price of red meat is higher than the price of healthy sources of protein, legumes in particular, substituting red meat with such sources of protein could allow for an improvement in the type and quality of the fruits and vegetables included in the school lunch program. Childhood obesity is a global epidemic.⁽⁶⁾ Over time, more diseases are being attributed to obesity and more children are starting to suffer from these diseases prematurely. The only way to stop this epidemic is by improving children's eating habits both at school and at home. Schools could improve their menus through sustainable and straight-forward modifications such as substitution of sugary drinks for water, brown rice for white rice, and healthy sources of protein for red meat; as well as increasing the quality, variety and taste of fruits and vegetables.

Studies have shown that obesity is an entirely preventable disease, which can be eradicated with good nutrition starting in early childhood.⁽⁴⁶⁾ The school lunch program could offer an ideal setting to promote healthy nutritional attitudes and behaviors that can be learned and maintained through life.

Table 1. Main food items offered to schoolchildren grades 1st to 6th attending the Jacó Central School during 9 observation days.

Day	Food items			
	White rice	Black beans	Salad†	Side dish
1	✓	✓	✓	Beef with sauce
2	✓	✓	✓	With chicken or tuna*
3	✓	✓	-	Chopped chayote with ground beef (picadillo)§
4	✓	✓	✓	Beef with sauce
5	✓	✓	✓	Cubed potatoes with tuna
6	✓	-	-	Chickpeas with pork and vegetables
7	✓	-	-	Boiled eggs in bean broth
8	-	-	-	Spaghetti with tomato sauce and white fresh cheese
9	✓	✓	✓	Beef with sauce

*Two types of menus were given the same day (some children got rice with chicken and others rice with tuna).

†Usually included chopped cabbage, tomatoes, carrots and lettuce.

§Typical dish from Costa Rica made with chopped chayote, sweet corn and ground beef.

Table 2. Times that specific food items were served and percentage of schoolchildren grades 1st to 6th attending the Jacó Central School who requested not to have a specific food item.

Food items	Girls		Boys	
	Times a food item was offered	Times a food item was not selected	Times a food item was offered	Times a food item was not selected
	N	n (%)	N	n (%)
White rice only	142	12 (8)	132	28 (21)
Black beans only	94	36 (38)	91	40 (44)
Salad†	68	23 (34)	63	25 (40)
Spaghetti §	42	9 (21)	49	4 (8)
Beef in sauce	44	6 (14)	25	11 (44)
Mixed dishes with pork or beef	28	5 (18)	31	15 (48)
Mixed dishes with fish or chicken	37	5 (14)	36	6 (17)

*A total of 361 children were observed during a 9-day period.

†Usually included chopped cabbage, tomatoes, carrots and lettuce.

§Served with tomato sauce and cheese.

Table 3. Estimated food portion weight (amount served) (g) by school grade in the Jacó Central School

Food items	School grades		Difference (g)	% Difference
	1-3	4-6		
	Estimated portion weight (g)	Estimated portion weight (g)		
White rice	94.6	138	43.4	50%
Black beans	60.4	104	43.6	70%
Salad*	59.1	54	5.1	10%
Spaghetti †	84.0	105	21	30%
Other dishes§	na	na	na	na

*Usually included chopped cabbage, tomatoes, carrots and lettuce.

†Served with tomato sauce and cheese.

§ The estimated portion weight and % discarded of red meat, chicken and fish could not be obtained because they were served part of mixed dishes and some were served with sauces.

Table 4. Estimated intake (g) and percent food discarded (%) from schoolchildren grades 1st to 6th attending the Jacó Central School during 9 observation days

Food item	Girls		Boys	
	Estimated intake (g)	% discarded	Estimated intake (g)	% discarded
White rice only	80.6	29	92.2	19.0
Black beans only	59.4	24	67.1	15.9
Salad*	46.2	20	39.1	30.0
Spaghetti†	86.4	9	85.8	6.1
Other dishes§	na	na	na	na

*Usually included chopped cabbage, tomatoes, carrots and lettuce.

†Served with tomato sauce and cheese.

§ The estimated portion weight and % discarded of red meat, chicken and fish could not be obtained because they were served part of mixed dishes and some were served with sauces.

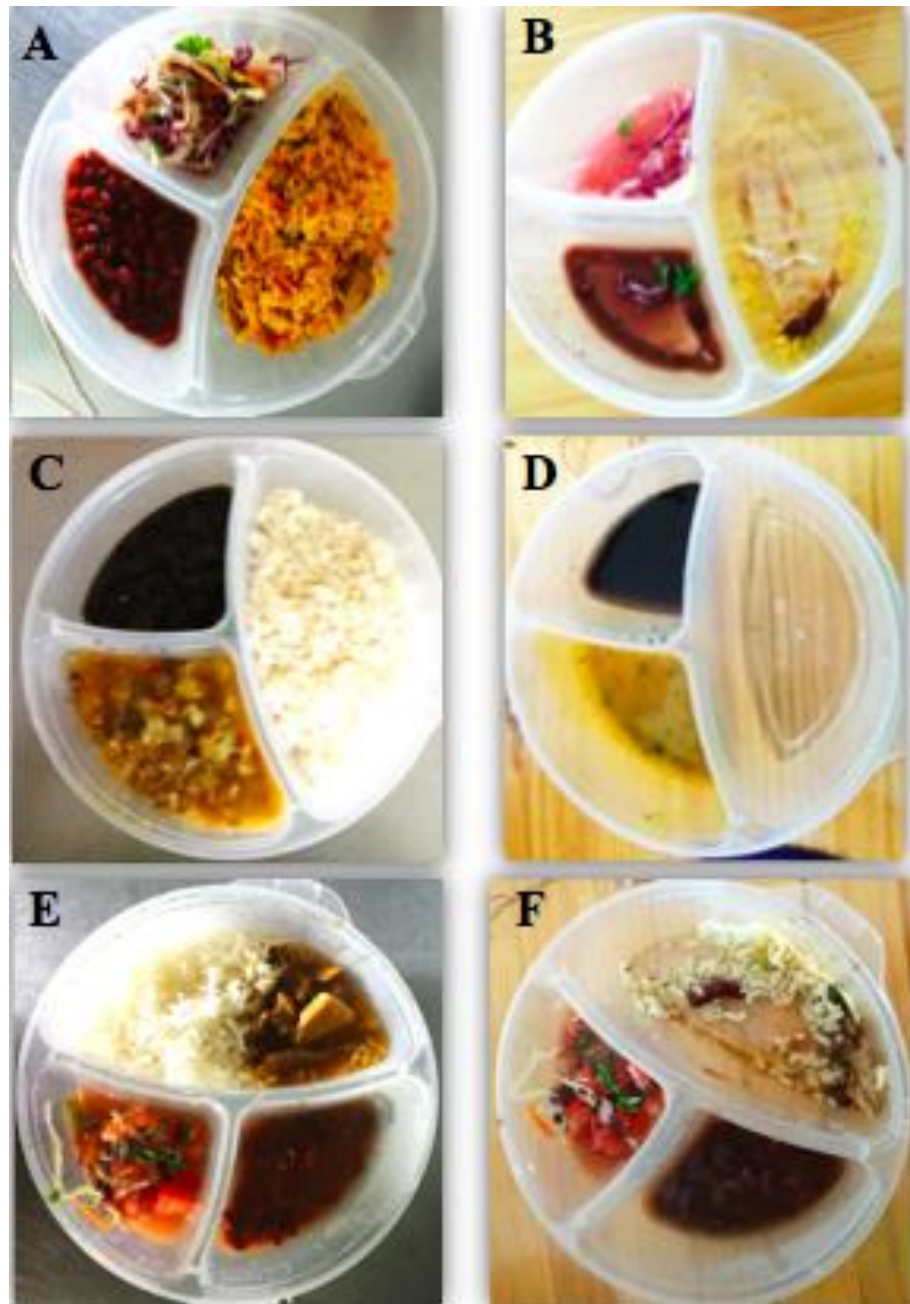


Figure 1. Photographs showing food items served (A, C, E) from selected menus versus foods discarded (B, D, F). Menus served were (A) rice with chicken, black beans, salad; (C) white rice, black beans, chopped chayote picadillo with ground beef and (E) white rice, black beans, salad and beef with sauce.

Conflict of Interest

The authors declare that there is no conflict of interest.

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