

Schoolchildren's diets and participation in school feeding programmes in Jamaica

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Abstract

Objectives: To describe food consumption during the school day of rural Jamaican children and participation in two government school feeding programmes. To determine factors which were related to these.

Design: Cross sectional.

Setting: 16 primary schools in rural Jamaica.

Subjects: 415 children in grades 2 and 5 (ages 7 and 10 years).

Results: Consumption of sweets, sweet drinks and snacks was high. Mean intakes at lunch were: energy 1537 kJ (SD 756), protein 10.4 g (SD 7.6) and iron 1.5 mg (SD 1.2). The mean energy intake was 17–20% of the daily requirement for this age group. Two types of school feeding programmes were available in the schools, one provided a cooked meal and the other a bun and milk. Median availability of school meals (as a percentage of children enrolled in the schools) over three terms was 24.6% (range 0–85.4%). Twenty per cent of the children participated in one or other programme. Poorer children were more likely to participate in the bun and milk programme (odds ratio 2.1, 95% CI 1.3–3.5) but children with more money to purchase food participated in the more costly cooked meal programme (odds ratio 2.4, 95% CI 1.3–4.6).

Conclusions: Energy intakes at lunch in Jamaican children were somewhat below optimal levels and the reliance on sweets and snacks is an area of concern. Programme characteristics such as meal cost, may affect access to school feeding by poor children.

Keywords
Dietary intakes

School feeding programmes

In many developing countries undernutrition and hunger among schoolchildren may affect their performance in school^{1,2}. In studies of the factors affecting school achievement we have shown that missing breakfast³, and hunger during the school day⁴ are not uncommon in Jamaican primary school and adolescent children. There is, however, little information on the diets of Jamaican schoolchildren with the last dietary surveys of this age group dating from the 1950s^{5,6}. Anecdotal reports suggest that many children eat only snacks and sweets at school, and more detailed information is needed on the food consumed by children during the school day to determine whether intakes are adequate and appropriate. Patterns learnt in childhood may continue into adult life, and with the increasing incidence of the non-communicable chronic diseases in the Caribbean⁷, it is important to ensure that good dietary habits begin during the school years.

School feeding programmes can improve children's nutritional status and reduce the incidence of short-

term hunger at school. They are, however, expensive and most developing countries do not have the resources to provide meals for all primary schoolchildren. Under these conditions it is important to ensure that children most in need participate in the programmes. Studies of the effects of missing breakfast in Jamaica and Peru suggest that undernourished children may benefit more from school feeding programmes than adequately nourished children^{8,9}. It may therefore be useful to target programmes to undernourished children or the poorest children.

Targeting requires additional screening and logistics to identify the children to be included in the programme. Jamaican school feeding programmes are not targeted because it is thought that they are self targeting (Ministry of Education, personal communication) and that children most in need will choose to access the programme. There is some evidence to support this as data from the *Jamaica Survey of Living Conditions 1994*¹⁰ indicate that, in the week preceding the survey, children in the poorest fifth of the

population were more likely to consume school meals than those in the other fifths. It is important to determine whether there are characteristics of feeding programmes which make self targeting more likely. This information should assist policy makers to decide whether targeting is necessary.

In Jamaica there are two main types of school lunch programmes. In the more traditional cooked meal programme, schools are provided with supplies such as flour, rice and oil, and grants to purchase additional items, and meals are prepared in the school canteen. The other programme, known as the Nutribun programme, provides a bun and milk or a sweet drink. These are prepared centrally and distributed to the schools. The bun and milk are intended to provide 1740 kJ and 11 g protein, there are no set objectives for the cooked meal programme. Most children who do not participate in the lunch programmes purchase food from street vendors or shops. Fewer children bring food from home or return home for lunch. Although school lunch programmes exist in all primary schools there is limited information on the adequacy of the programmes and the extent to which they reach children most in need.

The objectives of the present study were to describe the foods consumed by Jamaican children during the school day and to determine the characteristics of those children who selected to participate in the existing government school lunch programmes compared with those who did not and whether these varied with the type of programme. The study was conducted in schools enrolled in a randomized trial of school breakfast so we were also able to evaluate the impact of providing breakfast on children's food consumption later in the school day.

Methods

Sample

The study was conducted in 16 schools in four rural parishes in Jamaica. The children were participants in a trial of the effects of breakfast on children's school performance and growth. In that study the weights of all children in grades 2–5 were measured and 407 undernourished children (weight for age ≤ -1 SD of the National Center for Health Statistics references¹¹) identified. Four hundred and seven adequately nourished children (weight for age > -1 SD) were then selected matched for sex and school class to the undernourished group. Children in both groups were randomly assigned to receive breakfast (a cheese sandwich and flavoured milk) or to a control group who were given a piece of fruit. In order to determine if eating patterns varied between younger and older children, data on food consumption was collected for children in grades 2 (approximately aged 7 years) and 5

(approximately aged 10 years). All children in these two grades who were participants in the breakfast study were the target sample ($n = 453$). After repeated visits to the schools information was obtained for 415 children (92%), the remaining children were absent from school on all occasions.

Measurements

A form was developed to record information on the type and amount of food eaten by modifying that of Davidson and colleagues¹². The source from which the child obtained the food was also recorded. The method was pre-tested in a primary school which was not one of the 16 study schools to ensure its appropriateness. Two observers were trained to observe and record the types and portion sizes of food consumed by children. In order to obtain agreement on the portion sizes, food models and detailed guidelines were used. Pre-study reliabilities were conducted on 34 non-project children. The mean per cent agreement between the two observers was 96.2% for the type of food, 89.5% for portion size and 98.0% for the source of the food.

Information was obtained from the school principals on the type of school lunch programme available at the school and the quantity of buns and milk delivered each term (Nutribun programme) or the number of meals they were able to prepare (cooked meal programme).

An interview was conducted with the children to obtain information on their social background and details of breakfast eaten at home.

Procedure

The children's food consumption at the mid-morning break and at lunch were recorded on 2 days, at least 1 month apart. Prior to the first break of the school day, the children whose food consumption was to be recorded were identified. The children were asked to report to a specific observer at the mid-morning break, and present all food items to be eaten. Upon presentation of the food they were asked to state where they had bought or obtained the food. They were also asked to return and report if they shared any of their food with friends. If they were given additional food by other persons (e.g. friends or relatives) they were asked to bring these and show them to the observer. Each observer recorded the food consumption of between two and six children per day. Completeness of the observations was checked by questioning the children to ensure they had shown all items to the observer.

This procedure was repeated at lunch. Children who ate lunch at home were asked to report to the observer before going home. No information was recorded for these children.

Analysis

The energy, protein and iron contents of the items consumed by the children for lunch were calculated from the portion sizes and composition of the foods. The Nutritionist IV diet analysis programme (N-Squared Inc., 1993) was used after modifications to include local items in the database. Multiple regression analysis was used to determine child and social background characteristics associated with energy, protein and iron intakes, and logistic regression was used to identify factors which predicted whether children participated in the Nutribun or cooked meal programmes.

Results

Of the 16 schools in the study, eight participated in the Nutribun programme, four in the cooked lunch programme and four schools had both programmes. A total of 744 child observations were conducted, 329 children were observed for 2 days and 86 children for a single day, because they were absent from school on all repeat visits to obtain the second day's observation. The characteristics of the children whose food consumption was observed are given in Table 1. Most of the children reported eating breakfast at home. Sixty-seven per cent had a sandwich, porridge or cooked meal, 27% had bread or crackers and 6% reported having nothing to eat. Similarly 66% had a milk-based drink such as cocoa, 29% had a herbal tea with sugar but no milk and 5% had nothing to drink.

The number of meals available in the school lunch programmes was expressed as a percentage of the number of children enrolled in the schools. The median and range for the availability of meals is shown in Fig. 1. Four schools on the Nutribun programme did not receive any supplies in the first term. Three of these schools also had the cooked meal programme but in one school no meals were available. In the cooked meal programme four schools were unable to provide

any meals in the second term and three were unable to provide meals in the third term. When the two programmes are combined (four schools provided both) the median availability of meals was 23.8% in term 1, 28.6% in term 2 and 24.2% in term 3. Provision of lunch on both programmes was therefore often irregular and in most cases the number of meals or buns available daily was substantially less than the number of children in the schools.

Sweets, syrup drinks and snacks, such as Cheese Trix (artificially flavoured puffed corn), crackers, popcorn or biscuits, were the most commonly consumed items at the mid-morning break and the pattern of consumption was similar in children in grades 2 and 5. The energy provided by these items ranged from 210 to 630 kJ. Twenty-six per cent of the children did not have anything to eat or drink at break. Children who received breakfast at school were somewhat more likely to have nothing at break than children who did not (29% vs 22%, χ^2 5.27, $P < 0.05$). Items consumed at break were mostly obtained from street vendors with few items being brought from home or obtained from the school canteen. Vendors were also the most common source of items eaten at lunch (41% of items) followed by the school canteen (31% of items).

The type of lunch eaten by the children is shown in Table 2. Lunch type was determined by the main items eaten, although children sometimes bought additional items such as drinks and sweets from the vendors. The Nutribun and milk or drink cost 20 cents and were the only items available for less than 1 Jamaican dollar (= 0.04 \$US). The school cooked meals were substantially more expensive (\$6–10) and were comparable to the cost of cooked meals and other lunch items available from shops and street vendors such as patties (pastry with meat filling) and hot dogs.

Snacks and sweets were the most common type of lunch eaten by the children, followed by patties and sandwiches. Approximately 10% of the children had a Nutribun and milk or drink for lunch and 10% had a cooked school meal. Few children brought lunch from home but 18% went home for lunch. Seven per cent of the children had nothing to eat or drink at lunch while a further 6% had a drink only.

Average intakes at lunch were calculated for 242 children observed on 2 days (the remaining children observed on 2 days went home for lunch). The mean intakes were, energy 1537 kJ (SD 756), protein 10.4 g (SD 7.6) and iron 1.5 mg (SD 1.2). Using the recommended daily values for this age group (7560–8820 kJ, 27 g protein¹³) the children obtained 17–20% of their energy requirements at lunch and about one-third of the protein requirements. On average the children's lunches provided only 15% of their daily requirement for iron.

The mean intakes for the different types of lunches

Table 1 Characteristics of children in grades 2 and 5 who participated in the school diet study

	Grade 2 (boys = 110, girls = 94)		Grade 5 (boys = 113, girls = 98)	
	Mean	SD	Mean	SD
Age (months)	89.8	4.4	125.5	4.1
Weight for age (z-scores)	-0.7	1.0	-0.8	0.9
Height for age (z-scores)	-0.5	1.1	-0.5	1.1
BMI (kg/m ²)	14.8	1.3	15.9	1.7
Housing quality ¹	4.4	1.5	4.5	1.5
Household possessions ²	2.8	1.6	2.8	1.8
Home breakfast rating ³	3.2	0.9	3.2	0.9

¹ Rating of sanitation, water and electricity supplies and crowding, range 0–7.

² Possession of radio, television, refrigerator, stove, range 0–4.

³ Food and beverage at breakfast (nothing to eat = 0, bread/crackers = 1, sandwich/cooked meal = 2 plus nothing to drink = 0, herbal tea = 1, milk-based drink = 2) range 0–4.

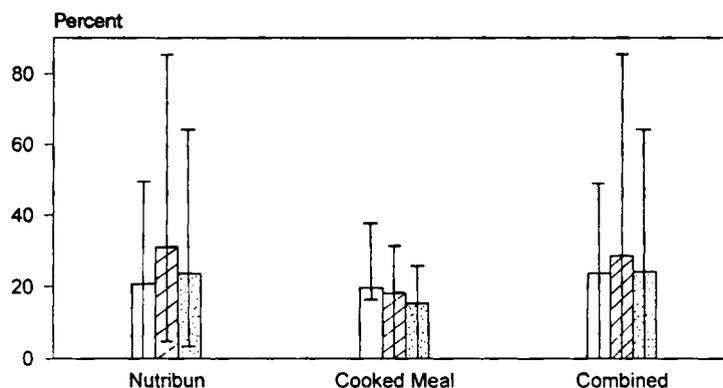


Fig. 1 Percentage of children (median and range) for whom school lunch was available. □ Term 1, ▨ Term 2, ▩ Term 3

are shown in Table 3. Using one-way analysis of variance (ANOVA) (excluding children who had nothing or a drink only for lunch) intakes of energy, protein and iron varied significantly by type of lunch ($P < 0.001$). Post-ANOVA contrasts showed that intakes of children who had snacks or sweets for lunch were significantly lower than those of children who ate other types of lunches, and intakes of children who had a Nutribun for lunch were lower than those of children who consumed a school cooked meal. The highest intakes were those of children who consumed the school cooked meal or a meal brought from home. Further details of the contrasts among the types of lunch are given in Table 3.

Using the average intakes over 2 days as the dependent variable, we conducted a stepwise multiple regression analysis to determine what socioeconomic and child characteristics predicted nutrient intakes (Table 4). Children who brought food from home, and who brought more money to school had higher energy and iron intakes. Girls had higher intakes of energy, protein and iron than boys, and children who were taller for their age had higher energy and protein intakes. Children from homes with more household possessions had higher iron intakes. The provision of a

school breakfast resulted in some substitution for children's total intakes as the children who received breakfast as part of the feeding trial had significantly lower energy intakes at lunch. The reduction in intake at lunch (227 kJ) was, however, much smaller than the energy provided by the breakfast (2436–2940 kJ).

Stepwise logistic regression was used to determine which factors predicted whether children selected to eat a Nutribun or a school cooked meal for lunch. Children who came from poorer homes as shown by fewer household possessions were more likely to consume a Nutribun for lunch (Table 5). In contrast, children who were better off as indicated by the amount of money brought to school were more likely to take part in the cooked meal programme. Children in grade 2 were twice as likely to consume a school cooked meal as children in grade 5, and children with poorer attendance ate cooked meals more often than children with better attendance. The children's nutritional status did not predict participation in either of the programmes.

Discussion

The mean energy intakes at lunch of these Jamaican schoolchildren were about 20% of their daily energy requirements. Assuming that lunch should provide about one-third of the day's requirements, since the evening meal at home is typically the main meal in Jamaica, this suggests that intakes were somewhat below optimal levels. Mean intakes of protein were adequate, although the intakes of children who only had a snack or drink were low. Iron intakes were generally low. Our results indicate that provision of a school breakfast resulted in a net increase in children's intakes although a small reduction in intakes at lunch occurred.

Children's energy and protein intakes were related to their height for age; however, it is not possible to be certain from this data whether children who became stunted because of undernutrition in early childhood

Table 2 Type of lunch consumed by grade and total group

	Grade 2 (<i>n</i> = 365) ¹		Grade 5 (<i>n</i> = 379)		Total group (<i>n</i> = 744)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Nothing	20	5.5	29	7.7	49	6.6
Drink only	14	3.8	32	8.4	46	6.2
Snacks/sweets	101	27.7	106	28.1	207	27.8
Nutribun	35	9.6	39	10.3	74	9.9
Patty/sandwich	55	15.1	56	14.8	111	14.9
School meal	44	12.1	29	7.7	73	9.8
Meal brought from home	8	2.2	13	3.4	21	2.8
Meal purchased from shop/vendor	20	5.5	11	2.9	31	4.2
Went home for lunch	68	18.6	64	16.9	132	17.7

¹ Number of observations.

Table 3 Energy, protein and iron content of schoolchildren's lunches

	Energy (kJ)		Protein (g)		Iron (mg)	
	Mean	SD	Mean	SD	Mean	SD
Nutribun (74) ¹	1823 ^a	617	14.7 ^{a,c}	6.2	0.5 ^a	0.7
School meal (73)	2503 ^b	739	22.0 ^b	8.2	3.4 ^b	1.8
Meal from home (21)	2264 ^{b,c}	861	17.5 ^c	9.8	2.2 ^{c,d}	1.1
Meal from vendor/shop (31)	2033 ^{a,c}	722	21.7 ^b	6.4	2.0 ^c	1.2
Patty/sandwich (111)	2045 ^c	743	14.1 ^a	6.4	2.5 ^d	1.4
Snacks/sweets (207)	1247 ^d	622	4.6 ^d	4.2	1.3 ^e	0.9
Drink only (46)	521	302	1.6	4.3	0.1	0.4

¹Values in parentheses are number of observations for each lunch type.

^{a-e} Within each column values with different superscripts are significantly different ($P < 0.05$) by type of lunch (post-ANOVA contrasts), children who had a drink only were excluded from these analyses.

continue to have low intakes or whether current intakes contribute to their lower height for age. As would be expected children who brought more money to school and with better socioeconomic status (more household possessions) had higher intakes at lunch.

Children who brought lunch with them from home had higher intakes than other children, the only children whose energy intakes were as high were those who consumed the school cooked meal; However, few children brought their lunch from home and consideration should be given to promoting this.

The high consumption of snacks, sweets and syrup drinks both for break and lunch is an area of concern. Although the snack and sweet items provide energy they are low in protein and micronutrient content and children who consumed these for lunch had the lowest protein intakes and low iron intakes. In addition, the frequent consumption of sweets increases the risk of dental caries. Part of the reason for children consuming these items may be their relative low cost particularly compared with cooked meals however, it is also likely that the children prefer them to more nutritious items. These children are developing poor dietary patterns which are likely to continue into adolescence and adulthood.

Despite the Jamaican Government's policy and stated commitment to providing school meals for all primary schoolchildren who need them, the supplies provided to the schools were only sufficient for about one-quarter of the children enrolled. The supply of meals was also irregular in several schools. Participation in the school feeding programmes was low, probably due to a combination of unavailability of meals and students opting not to participate. Only 10% of children in the schools which offered the Nutribun programme were actually observed to eat that for lunch and a similar percentage had school meals in the schools on the cooked lunch programme. This is somewhat less than the participation rates reported in the *Jamaica Survey of Living Conditions 1994*¹⁰ in which 34% of children in rural areas participated in one or other of the programmes in the week preceding the survey. Children in urban areas are provided with the same school feeding programmes and the findings of the present study may also be relevant there. In urban areas children may have greater access to vendors and shops, and in the *Jamaica Survey of Living Conditions 1994* lower participation rates of 26–30% were reported for urban children. The irregular supply of food may contribute to the students selecting to obtain food elsewhere since they are unable to depend on the

Table 4 Stepwise multiple regression of energy, protein and iron intake at lunch time on child characteristics and socioeconomic status¹

	Energy (kJ)		Protein (g)		Iron (mg)	
	B	SE	B	SE	B	SE
Brought food to school	424	105***	—	—	0.6	0.2***
Breakfast/placebo group	-227	92*	—	—	—	—
Height for age	97	42*	1.2	0.4**	—	—
Sex	197	92*	2.4	1.0*	0.4	0.15**
Amount of money brought to school (square root)	71	34*	—	—	0.1	0.05*
Household possessions	—	—	—	—	0.1	0.05*

¹ Intakes are averages of 2 days observations. Variables offered: grade, sex, height for age, BMI, home breakfast rating, treatment group (breakfast/placebo), nutrition group (undernourished/adequately nourished), brought food to school (yes = 1, no = 0) money brought to school (square root), housing rating, household possessions, principal caretaker (mother = 1, other = 0).

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Table 5 Characteristics predicting participation in Nutribun or cooked meal programmes¹

	Odds ratio	95% CI
<i>Nutribun</i> ²		
Household possessions ($\leq 2 = 1, > 2 = 0$)	2.14	1.30–3.49
<i>Cooked Meal</i> ³		
Grade (2 = 1, 5 = 0)	2.27	1.24–4.17
Money brought to school ($< \$10 = 0, > \$10 = 1$)	2.44	1.30–4.56
% attendance	0.98	0.96–0.99

¹Stepwise logistic regression, variables offered: grade, sex, height for age, BMI, home breakfast rating, treatment group (breakfast/placebo), nutrition group (undernourished/adequately nourished), brought food to school, money brought to school, housing rating, household possessions, % attendance.

²Analysis done for 12 schools offering this programme.

³Analysis done for eight schools offering this programme.

school programme. The results also suggest that there may be wastage of meals in some schools. Logistical problems often impede the delivery of school meals in many countries. More operational research is necessary into the most efficient ways of ensuring that school meals reach all children in need.

An important finding from this study was that while poorer children tended to access the Nutribun programme, it was the children who had more money to bring to school who were able to take part in the cooked meal programme. The price differential in these is clearly important and the cost of the cooked meals appears to prevent the neediest children from obtaining a school lunch. We are unaware of any comparable data from a developing country; however, participation in the National School Lunch Program (NSLP) in the USA was negatively associated to meal price¹⁴ and price has been reported to be the most important predictor of participation in that programme¹⁵. The school cooked meals provided the highest intakes at lunch of all the lunch types but at substantially higher cost to the children than the Nutribun. Where this type of programme is used it is clearly important to ensure that undernourished and/or poor children can take part, possibly through providing meals free, or at a subsidized cost, for the neediest children. The Nutribun and milk were heavily subsidized and were cheaper than the snacks, sweets and syrup drinks commonly consumed by the children. This differential in price is probably important to promote selection of the more nutritious option by schoolchildren.

Younger children were more likely to participate in the cooked meal programme. In the USA, greater participation rates in the NSLP were also observed among younger students¹⁴ and it is possible that school feeding programmes reach younger children more effectively. The association between attendance and participation suggests that children who attended school more regularly were less likely to depend on the school cooked meal for lunch. Neither of the

programmes was self targeting to undernourished children who were not more likely to participate than adequately nourished children.

This study has highlighted issues which are important for school feeding policy in Jamaica and elsewhere. Our results suggest that irregular supply may affect participation and it may be preferable to target programmes to fewer schools or to poor/undernourished children, and provide them with adequate supplies rather than to try to reach all children in a sporadic manner. The cost of the meal is also critical in determining whether children most in need access the programme.

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