THE DIETARY INTAKE AND NUTRITIONAL STATUS OF RURAL SCHOOLCHILDREN IN JAMAICA

by

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1.0 INTRODUCTION

Studies on the dietary intake and nutritional status of children in Jamaica, have generally focussed on babies and young children. These latter have always been regarded as being more vulnerable to under- and malnutrition, than older children.

1.1 Dietary Intake

The least studied of the related issues, is that of dietary intake among older Jamaican children of school age. Fox et al (1968) looked at food items eaten by children aged 6 months to 6 years. Among those from 1 to 3 years the median number of items consumed daily was 12. This increased to 17 items in the 3 to 6 year age range.

The indication among the older children (ibid. 1968) however, was that their energy intakes were well below the requirements, and this deficit was more pronounced at the puberty. The dietary intake patterns among the sample children, showed a high dependence on cereals and sugars. These contributed nearly 60% of total caloric intake of the 1-3 year old children. Dairy products, starches, and fats and oils were also commonly used.

In another study by Walker (1988), poor urban children aged 9 to 24 months were also shown to rely on cereal intakes. Items from this food group were consumed more than once per day by 81-87 percent of the study children. Consumption of starchy foods was however, said to have declined relative to the findings in the Fox et al (1968) study. Also eaten with apparent regularity (Walker, 1988) were sugars, dairy products, and fats and oils. Meat and fish items were also had by most of the children, although in small portions.

Listed amongst the groups/items from which there was infrequent consumption, were eggs, legumes and nuts, vegetables and fruits.

The patterns of consumption observed (ibid. 1988) for certain individual items, were also of interest. The most commonly used cereals, were flour and rice. The milk products most consumed were sweetened condensed milk, and skimmed milk powder, with whole milk being used on a much lesser scale. Cheese was only given to 30-40% of the children. Among the meat and fish items, chicken (including chicken neck and back, and chicken feet) was the most frequently used item. Liver, fresh fish and mackerel were had to a lesser extent. The relatively high consumption of chicken was said (ibid., 1988) to be noticeably higher than that reported by Fox et al (1968) in the earlier study.

A study of the eating patterns of 12-14 year old school children in two (2) schools in Guyana (Fox, 1974), found that cereal and cereal products were consumed in higher proportions than any other category of food. Rice was often used with pulses and peas. Fresh vegetables e.g. callaloo, had a high consumption frequency, and these were often used with meat, fish and shrimp. Overall, there was a high average protein intake (90% of RDA for males, and 87% for females), and the frequent use of dark green leafy vegetables was felt to be one of the important contributing factors.

Somewhat further afield, in Louisiana, the diets of rural school children aged 10-16 years were assessed as part of a study on cardiovascular diseases (Frank et al, 1977). Using a 24-hour recall methodology, it was found that nutrient intakes generally increased with age, with the mean caloric intake for all the children being slightly more than 2,000 kcal. Animal proteins provided more than one-half (1/2) of protein calories, and fat was mainly from

animal rather than vegetable sources. Sugars accounted for 25 percent of total calories, while starch contributed an average of 18 percent.

Comparisons with the Recommended Dietary Allowances (ibid., 1977) showed that although boys were better off than girls, at least one-third (1/3) of the boys ate less than two-thirds (2/3) of the allowances for calories, vitamin A, ascorbic acid, iron, calcium, and niacin. Protein and riboflavin intakes however, were adequate for most children. Noteworthy was the fact that 83% of the boys, and 70% of the girls consumed more than 100% of their allowances for protein. These intake levels were questioned by the researchers as being consistent with good health.

Despite the increased awareness of the likely relevance of dietary intake to nutritional and health status, only limited data have been forthcoming, particularly from Jamaica and other Caribbean countries.

1.2 Nutritional Status and School Performance

Among the issues for further study on dietary intake, are (i) nutritional status, and (ii) school performance. Low scholastic achievements by Jamaican children in recent times, have led some researchers to investigate the role of nutrition in facilitating the learning process. Powell et al (1983) found that the provision of breakfast to school children had a significant, positive effect on both school attendance, and arithmetic scores.

Further indications of the relationships between feeding and cognitive functioning were found by Simeon and Grantham-McGregor (1989). Children who were previously

malnourished, and stunted children, were adversely affected in fluency (generation of ideas and motivation), coding (visual short-term memory), and arithmetic.

Nutritional status measures have indicated differences in the size of children, according to geographic location (Ashcroft et al, 1977). Those from the hilly inland districts were smaller than their counterparts from the coast, plains, and city. This was so despite an overall increase in size of the Jamaican school children over the period 1967-1977.

More recent investigations (Fox, 1986) showed that many school children were marginally undernourished according to a height-for-age indicator. This indicated a history of malnutrition, or suboptimal food intake. There was no support (ibid. 1986) however, for low dietary intake at the time of the survey - as would have been indicated by low weight-for-height measures.

In a recent CFNI report (1989), it was shown that 6.5% of the rural school children studied were stunted (height-for-age), while 2.8% of them were wasted (weight-for-height).

1.3 Current Study

The primary objective of the current study, was to assess in greater detail, the dietary intake patterns of rural school children participating in a World Food Programme (WFP) school feeding evaluation. These data were collected in 1987, from approximately 1,100 rural school children in two parishes in Jamaica, West Indies. Further analyses of the data were conducted, to achieve the following objectives:

1. Assess detailed dietary intake patterns and nutritional status of the rural sample of children;

2. Determine the representativeness of established food groups, to their daily dietary intake;
3. Compare the dietary patterns of children in hilly inland rural areas, with those of children from low-lying and coastal regions;
4. Determine the relative contributions from local versus imported food items, according to dietary intake;
5. Assess the relative influences of household background factors including household size, levels of expenditure, as well as children's age and sex, on the intake of food, and nutritional status.

2.0 METHODOLOGY

This study represented a dietary intake analysis of data from approximately 1,100 rural school children aged 6-15 years. The original sample participated in an evaluation of the World Food Programme (WFP) school feeding programme in the parishes of Trelawny and St. Ann, Jamaica.

For purposes of the current study, 24-hour dietary recalls collected for the children, were analysed in more detail, to assess:

- intake of different types of food items, by category
- intake in respect of recommended dietary allowances of (i) energy, (ii) protein, (iii) calcium, (iv) iron, (v) R.E. vitamin A, (vi) thiamin, (vii) riboflavin, (viii) niacin, and (ix) vitamin C.

The relationships between certain background variables e.g. gender, geographic location, school attendance, and dietary intake variables, were also assessed.

The data available on nutritional status of the children, was insufficient for the detailed analyses being conducted herein.

2.1 Study Schools

The subjects were drawn from schools in two parishes - Trelawny, and St. Ann. Schools in the former parish were participating in the WFP school feeding programme, while those in the latter were not.

The ten (10) schools were:

TRELAWNY	ST. ANN
Falmouth	Exchange
Clark's Town	Madras
Sawyers	Bamboo
Albert Town	Claremont
Warsop	
Lowe River	

The relative locations of these schools are shown in Figure 1. The current analysis, Falmouth, Clark's Town and Exchange were regarded as coastal regions. All other schools were located in hilly inland areas.

Definition of the geographic areas was as follows:

Coastal - those located on, or near to (approximately 5 miles depth) the coast, viz. Falmouth, Clark's Town, Exchange.

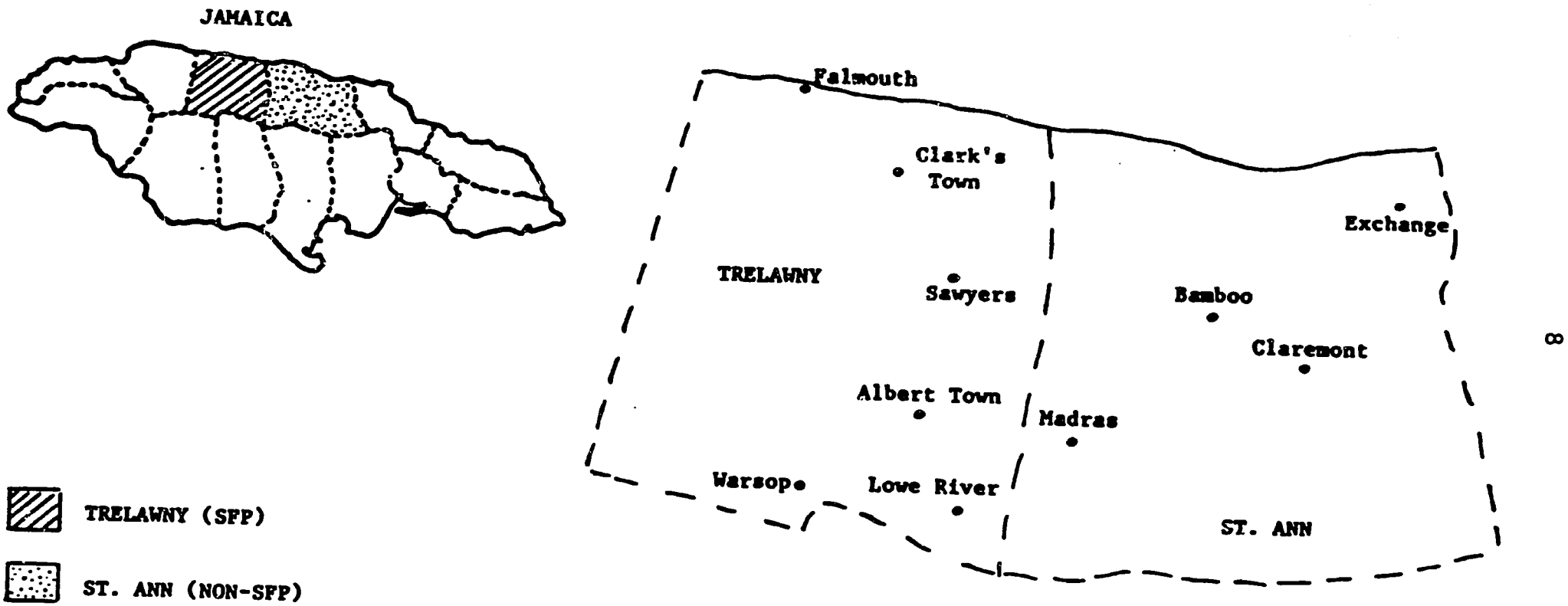
Hilly Inland - those located further inland and/or in hilly interior regions.

Students representing a 15% sample were chosen on a random basis from each school - by using complete school listings based on enrollment.

2.2 Data Collection

The main instrument used for data collection, was a detailed questionnaire, which was administered within the households (for most children). The questionnaires addressed a range of issues, in the following categories:

FIGURE 1: Relative Locations of Study Schools



A - target child's school background

B - household background

C - target child's background

D - target child's school expenses and feeding patterns

E - background on other dependent children

F - parental attitudes towards school attendance, and achievement

G - household agricultural situation

H - housing information

I - household economic background

J - 24-hour dietary recall

Interviews were conducted between April and June 1987. The interviewers were teachers at the respective schools, who had been trained before the study.

2.3 Dietary Intake Data Collection

Dietary intake data was collected by requesting 24-hour dietary recall information, relating to the day preceding the interview. Caretakers were asked to give details regarding:

- household meal preparations (which formed the basis of assessing portions from the "family pot"); and
- target child's intake.

Additional foods consumed away from the home e.g. at schools, were also recorded. The importance attached to this particular aspect was stressed to - and by - the interviewers.

The training sessions with the interviewers included a detailed module for recording 24-hour dietary recall data. Specific points during the training sessions (and included in the interviewers' manuals) included:

- the type, - amount -, and preparation methods for foods were all to be recorded
- records of 'amounts' were made with reference to measures typically used e.g. gallon bottle, cook spoon, cheese pan
- amounts should be recorded for
  a) ingredients in a recipe
  b) the total amount prepared
  c) the amount or portion the child received
- spoon measures should indicate whether they were heaped or level
- size estimates should be given for ground provisions, fruit etc. - applicable for e.g. bananas, yams, mangoes
- each item (except for seasonings) used in e.g. soups, rice and peas, and one-pot meals, must be recorded, with appropriate details
- methods of preparation should indicate whether the foods were fried, boiled, stewed - and the amount of gravy, sauce or fat served with the (child's) portion
- care should be taken to identify the exact type of baked product where applicable, e.g. light cake, pudding, bulla, fruit cake

- typical foods served in the school setting were discussed in detail, with guidelines for estimating typical portions, ingredients and weight

Primary information was obtained from the caretaker but with input from the target child, who might have provided additional information on snacks eaten away from home.

2.4 Dietary Intake Data Processing

Encoding of data was focussed on the following factors:

- identifying the exact types of food in the children's portions - with reference to the CFNI's 'Food Composition Tables' -, and assigning unique codes as appropriate; and
- identifying and recording the exact unit codes as applicable to the portions consumed by the target children - measures, weights etc.

Reference was made during this phase of data processing, to additional standards used by CFNI, and the Tropical Metabolism Research Unit (TMRU). These provided further guidelines for assignment of weights and measures per food portion.

In the previous study report, only limited analyses of dietary recall data were conducted for a sub-sample of the children. Earlier problems in the computer programme format were corrected for purposes of the current study - and the additional data were entered and merged with those previously entered.

The analyses of data included a series of frequency distributions; as well as cross tabulations, t-tests, analyses of variance, and regression analyses.

3.0 RESULTS

The total sample size on which analyses were conducted was 1,078.

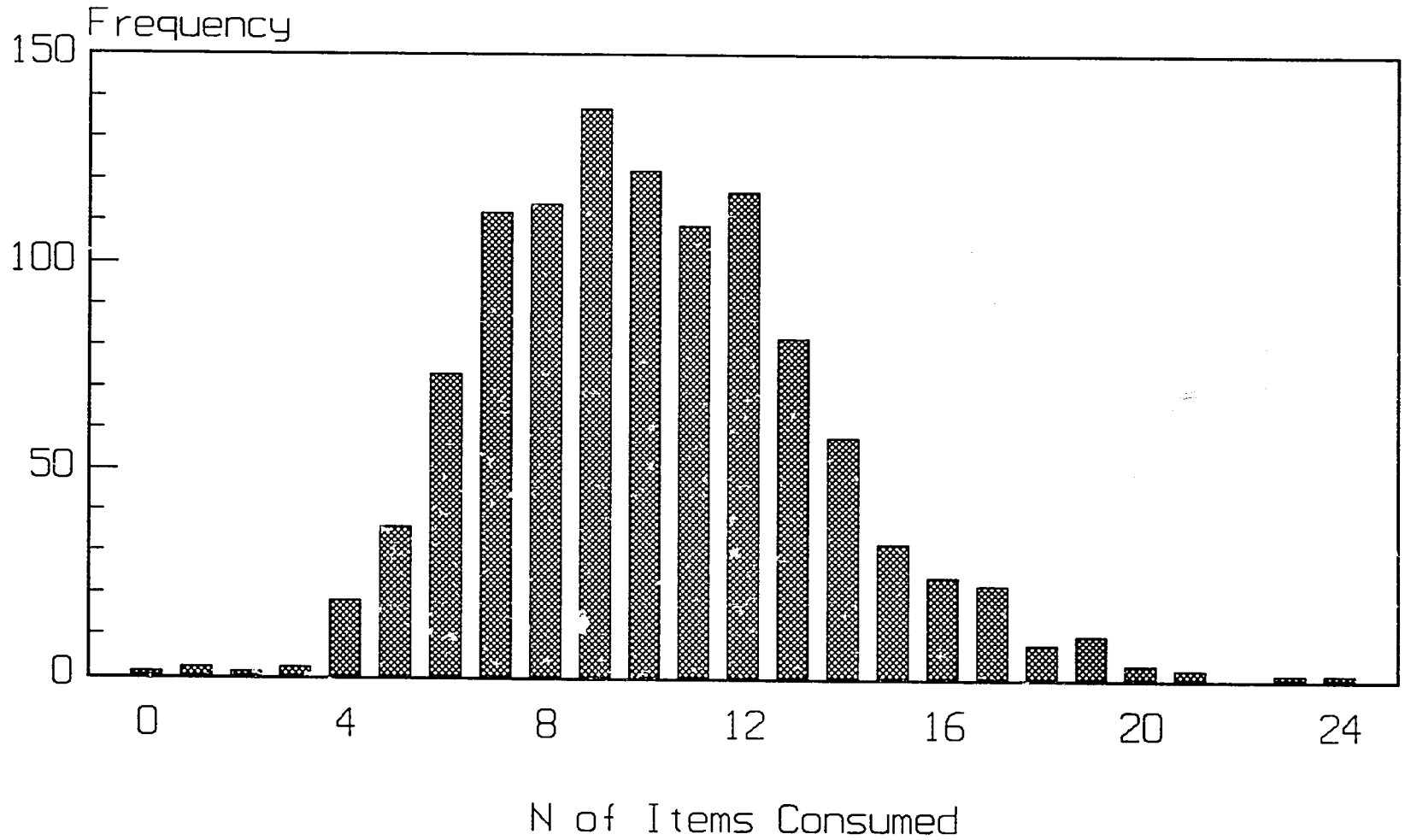
3.1 Number of Food Items Consumed

The mean number of food items consumed in a 24-hour period, was 10.17 (SD = 3.31). The median of the distribution was 10.00, with a minimum of zero (0.0) and a maximum of 24.00. The respective frequencies are shown in Figure 2. One (1) child ate nothing at all for the entire day.

The number of items varied significantly (t-test; $p<.01$) according to the geographic area in which the child lived (measured by the location of the school). Those children in coastal regions had an average of 11.03 (SD = 3.68) items, compared with an average of 9.81 (SD = 3.09) items consumed by their counterparts in the hilly inland regions.

The farming status of the household, was also an important factor differentiating number of items consumed. Those children in households where at least one member farmed, ate an average of 10.00 (DS = 3.27) items, while those in non-farming households, ate 10.58 (SD = 3.42) items. The difference was a significant (t-test; $p<.01$) one.

FIGURE 2: Total Number (N) of Items Consumed



3.2 Representation of Food Categories

A total of 12 food categories were used in the basic analyses. All of these were represented in the consumption patterns of the sample (Figure 3). The staples (cereals; and starchy fruits, roots and tubers) accounted for 36.3% of the items eaten. Foods from animals (milk and milk products; meat and poultry; fish and shell fish; and eggs) represented 22.9% of the items.

The variety of food items eaten, was greater within some categories (e.g. cereals) than in others (e.g. pulses, vegetables). Figure 4 shows variety by food categories. Cereals and starchy foods were fairly well represented in the average diet (i.e. number of items). There were some food categories however, from which most children did not consume any items. These included:

- pulses, nuts and oil seeds (approx. 75% consumed no items)
- vegetables (approx. 57% consumed no items)
- fruits (approx. 62% consumed no items)
- eggs (approx. 78% consumed no items)
- fish and shell fish (approx. 78% consumed no items)

A listing of items representing 0.1 % or more of food intake, is given in Appendix I. Certain foods were consumed by surprisingly low percentages of the sample. Those included:

- cornmeal - 1.4%
- yam, yampie etc. - 5.1%
- canned fish - 1.2%

FIGURE 3: Representativeness of Food Categories in Daily Food Intake

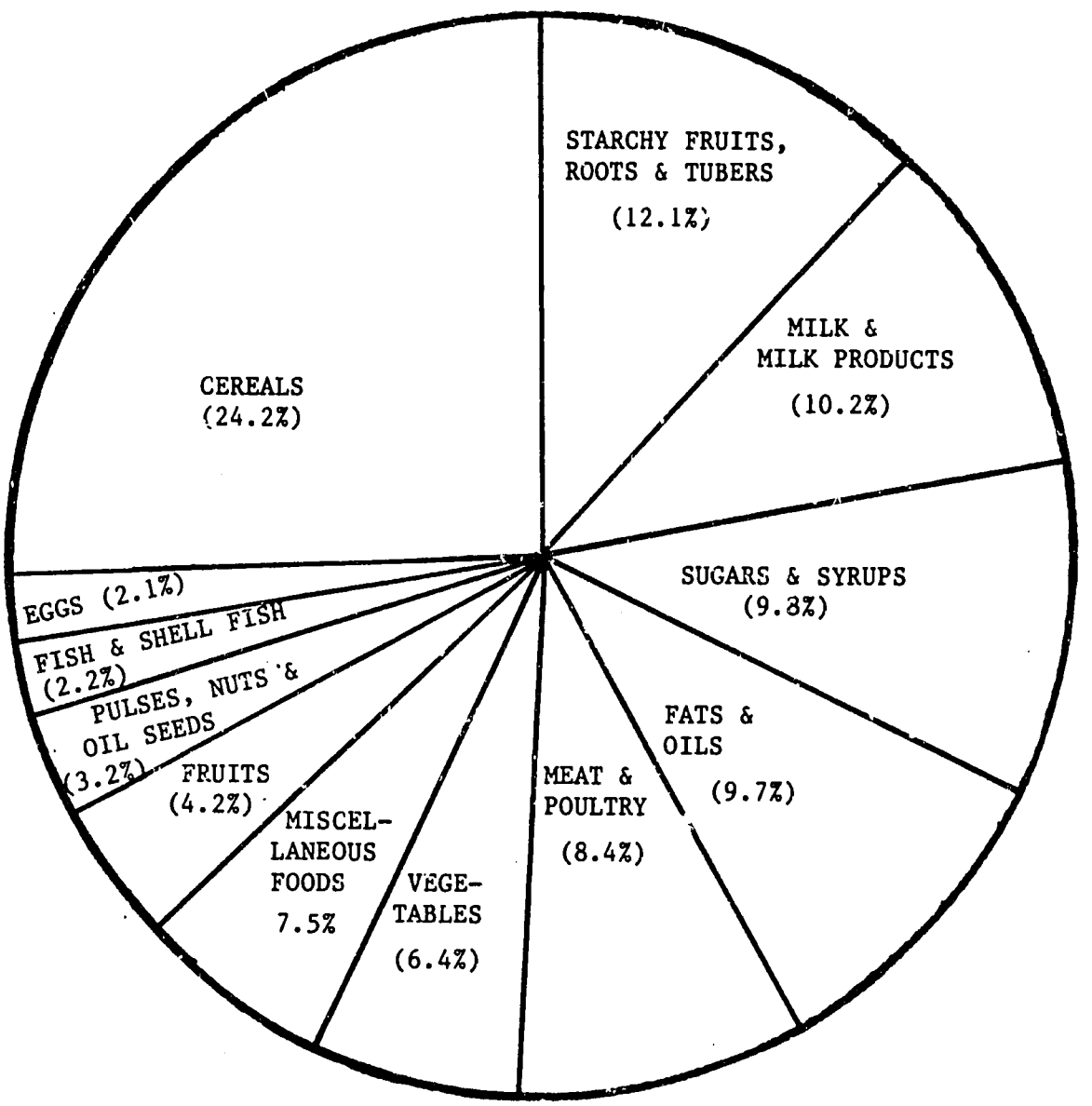
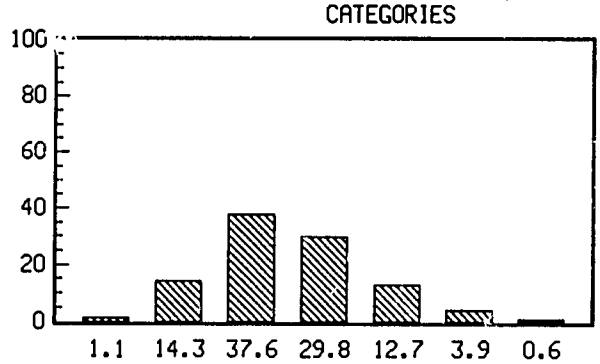
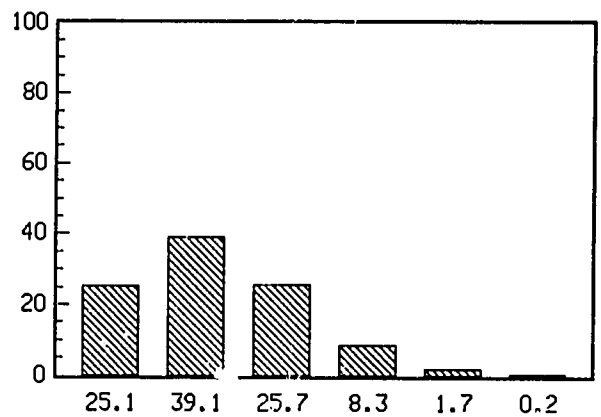


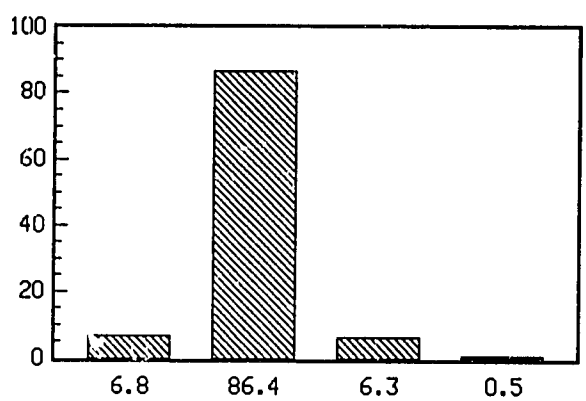
FIGURE 4: VARIETY OF ITEMS CONSUMED WITHIN DIFFERENT FOOD CATEGORIES



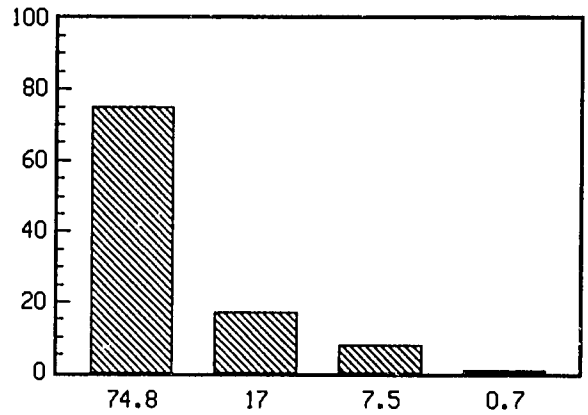
Cereals



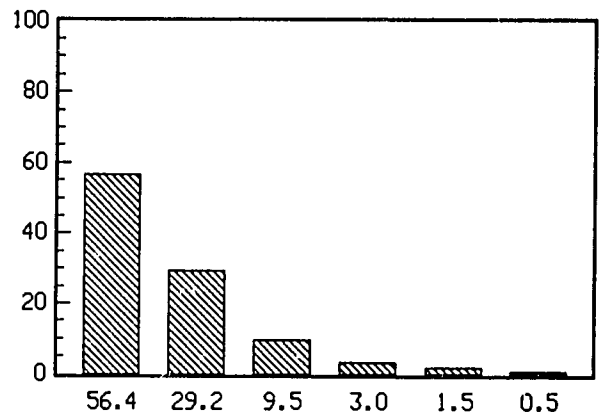
Starchy Fruits, Roots & Tubers



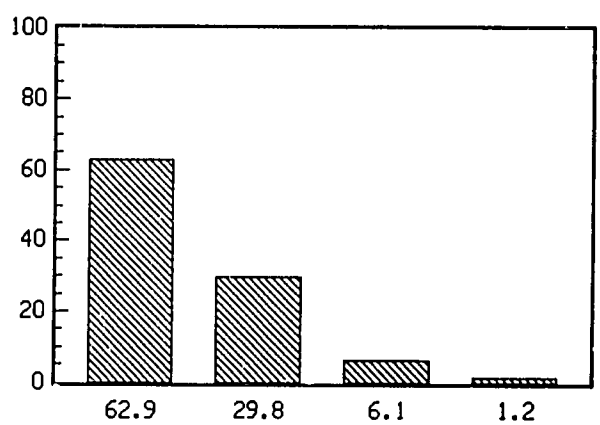
Sugars & Syrups



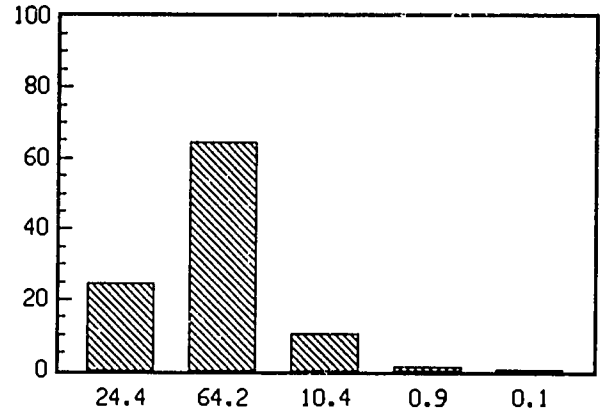
Pulses, Nuts & Oil Seeds



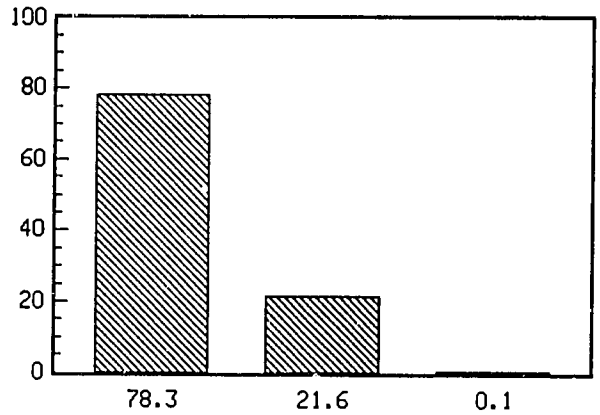
Vegetables



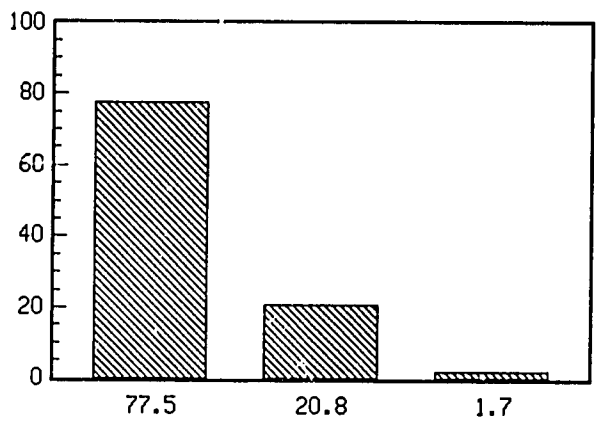
Fruits



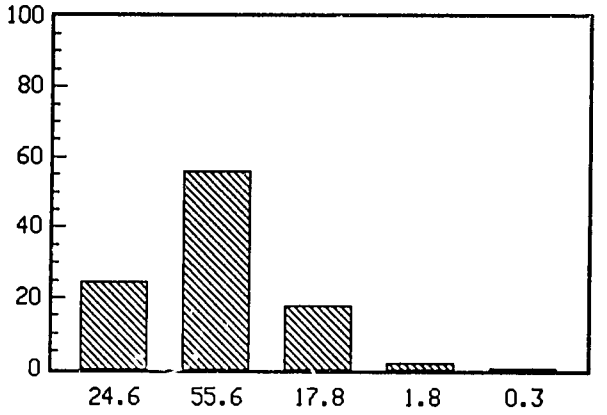
Meat & Poultry



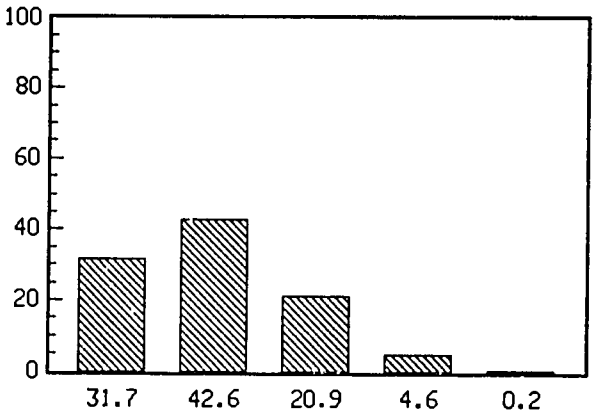
Eggs



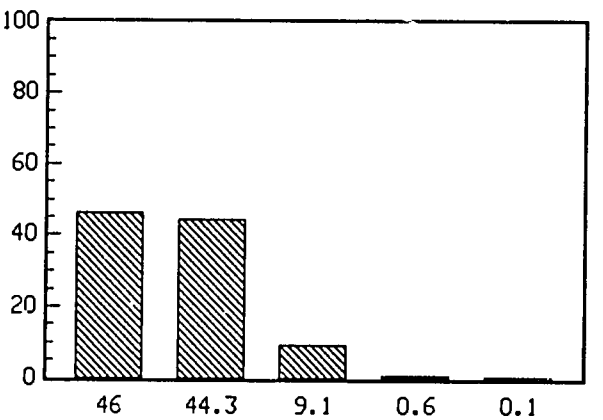
Fish & Shellfish



Milk & Milk Products



Fats & Oils



Miscellaneous Foods

Although the yam-type foods eaten represented only 5.1% of the total range of foods, many of the study regions were in small farming communities which specialise in yam. Further, the qualitative reports did indicate high levels of yam consumption. Given the type of analyses used in the current study it is likely that such patterns may have been due to seasonality or were confined to the yam-growing regions; but not clearly identified as such here.

The relative effect of geographic area on number of food items eaten was assessed as in Table 1. For ground provisions such as those in the category "Starchy fruits, roots and tubers", there was a significant difference according to location ($X^2 = 24.2$; $p < .01$). Fewer children in the coastal regions ate foods from this category, but among those who did, a wider variety of items were consumed. There was no difference between the regions, for the consumption of:

- cereals
- fruits
- milk and milk products

Eggs did not enjoy high levels of consumption - more so in the hilly inland regions than in the coastal areas. Consumption of "sugars and syrups" was high, but was mainly limited to 1 or 2 items regardless of location.

It should be noted that frequency of consumption of condensed milk - often used as a sweetener - represented 5.6% of the total food item frequency (Appendix I). This was quite high. Condensed milk however, officially belongs to the category "milk and milk products".

TABLE 1: Mean Number of Items Consumed in Each Food Category According to Geographic Area

Food Categories	Geographic Area	No. of Items (%)								
		0	1	2	3	4	5	6	7	
1. Cereals	Coastal	0.6	15.0	36.9	27.1	15.0	5.1	0.3	-	$x^2 = 6.8$; n.s.
	Hilly inland	1.3	14.2	37.7	30.9	11.9	3.2	0.7	0.1	
	TOTAL SAMPLE	**1.1**	**14.4**	**37.5**	**29.8**	**12.8**	**3.8**	**0.6**	**0.1**	
2. Starchy Fruits, Roots and Tubers	Coastal	30.9	37.3	17.8	11.5	2.2	0.3	-	-	$x^2 = 24.2$; $p < .01$
	Hilly inland	22.6	40.0	29.0	7.0	1.3	0.1	-	-	
	TOTAL SAMPLE	**25.0**	**39.2**	**25.7**	**8.3**	**1.6**	**0.2**	-	-	
3. Sugars and Syrups	Coastal	10.8	78.7	9.9	0.6	-	-	-	-	$x^2 = 23.2$; $p < .01$
	Hilly inland	4.9	89.7	4.9	0.4	-	-	-	-	
	TOTAL SAMPLE	**6.7**	**86.4**	**6.4**	**0.5**	-	-	-	-	
4. Pulses, Nuts and Oil Seeds	Coastal	75.8	13.4	9.6	1.3	-	-	-	-	$x^2 = 8.1$; $p < .05$
	Hilly inland	74.3	18.4	6.8	0.4	-	-	-	-	
	TOTAL SAMPLE	**74.8**	**16.9**	**7.6**	**0.7**	-	-	-	-	
5. Vegetables	Coastal	52.5	23.2	13.1	6.7	3.2	1.3	-	-	$x^2 = 49.9$; $p < .01$
	Hilly inland	57.8	31.8	8.0	1.6	0.7	0.1	-	-	
	TOTAL SAMPLE	**56.2**	**29.3**	**9.5**	**3.1**	**1.4**	**0.5**	-	-	
6. Fruits	Coastal	58.0	33.1	7.0	1.9	-	-	-	-	$x^2 = 6.1$; n.s.
	Hilly inland	65.2	28.2	5.6	0.9	-	-	-	-	
	TOTAL SAMPLE	**63.1**	**29.7**	**6.0**	**1.2**	-	-	-	-	

Food Categories	Geographic Area	No. of Items (%) 0	1	2	3	4	5	6	7	
7. Meat and Poultry	Coastal	23.9	55.4	18.8	1.6	0.3	-	-	-	$x^2 = 42.7$; $p < .01$
	Hilly inland	24.5	68.3	6.6	0.7	-	-	-	-	
	TOTAL SAMPLE	**24.3**	**64.5**	**10.2**	**0.9**	**0.1**	-	-	-	
8. Eggs	Coastal	67.2	32.5	0.3	-	-	-	-	-	$x^2 = 34.8$; $p < .01$
	Hilly inland	83.2	16.8	-	-	-	-	-	-	
	TOTAL SAMPLE	**78.4**	**21.5**	**0.1**	-	-	-	-	-	
9. Fish and Shell Fish	Coastal	73.6	23.6	2.9	-	-	-	-	-	$x^2 = 7.4$; $p < .05$
	Hilly inland	79.5	19.4	1.1	-	-	-	-	-	
	TOTAL SAMPLE	**77.8**	**20.6**	**1.6**	-	-	-	-	-	
10. Milk & Milk Products	Coastal	22.0	57.0	19.1	1.6	0.3	-	-	-	$x^2 = 2.0$; n.s.
	Hilly inland	25.5	54.9	17.2	2.0	0.3	-	-	-	
	TOTAL SAMPLE	**24.5**	**55.6**	**17.8**	**1.9**	**0.3**	-	-	-	
11. Fats & Oils	Coastal	30.6	37.9	21.3	9.9	0.3	-	-	-	$x^2 = 28.1$; $p < .01$
	Hilly inland	31.7	44.7	21.0	2.5	0.1	-	-	-	
	TOTAL SAMPLE	**31.4**	**42.7**	**21.1**	**4.7**	**0.2**	-	-	-	
12. Miscellaneous Foods	Coastal	40.4	46.2	11.5	1.6	0.3	-	-	-	$x^2 = 17.1$; $p < .01$
	Hilly inland	48.3	43.7	7.9	0.1	-	-	-	-	
	TOTAL SAMPLE	**46.0**	**44.4**	**8.9**	**0.6**	**0.1**	-	-	-	

3.3 Nutrient Intake

Almost one-half (1/2) of the caloric intake (47.3%) in the sample children, was from cereals (Table 2). Among the other categories, the following also made significant contributions:

- sugars and syrups (10.7%)
- starchy fruits, roots and tubers (9.8%)
- fats and oils (7.8%)
- meat and poultry (7.6%)

The cereals were also the chief sources of protein and iron respectively.

3.4 Recommended Dietary Allowances (RDAs)

The extent to which the foods consumed, satisfied the RDAs for different nutrients, was also assessed. These estimates were necessarily regarded as tentative for certain nutrients e.g. thiamine, riboflavin and niacin. The main reason for this was the use of a single 24-hour recall only, instead of a series of the same. Further, the seasonality of certain items has to be considered, in reviewing the data.

Table 3 indicates that the children's intake generally satisfied the requirements for:

- protein
- vitamin C
- vitamin A
- iron
- thiamine

TABLE 2: Nutrient Intake From different Food Categories

FOOD CATEGORY	— Mean Proportion (%) of Nutrients —					
	Calories		Protein		Iron	
	Mean	SD	Mean	SD	Mean	SD
1. Cereals	47.3	18.4	46.4	19.0	37.8	18.9
2. Starchy Fruits, Roots & Tubers	9.8	12.9	7.1	11.3	12.5	15.2
3. Sugars & Syrups	10.7	10.1	0.0	0.5	15.6	13.9
4. Pulses, Nuts and Oil Seeds	2.5	6.5	3.9	8.9	5.3	11.5
7. Meats and Poultry	7.6	8.4	19.2	17.5	10.2	10.4
8. Eggs	0.9	2.1	2.4	5.3	2.1	4.7
9. Fish & Shell Fish	1.5	4.3	4.4	11.2	1.6	6.3
10. Milk & Milk Products	5.9	7.7	10.4	15.1	1.6	3.3
11. Fats & Oils	7.8	10.4	0.1	0.7	0.0	0.0
12. Other (including vegetables, fruits, miscellaneous foods)	6.0	-	6.1	-	13.3	-
	100.0		100.0		100.0	

TABLE 3: Proportion of Recommended Dietary Allowances (RDAs) for Various Nutrients Satisfied By Actual Intake (N=1055)

	Energy	Protein	Calcium	Vitamin C	Vitamin A	Iron	Thiamine	Riboflavin	Niacin
Mean	88.7	147.0	84.9	300.0	103.8	161.4	102.5	71.7	82.8
Median	80.0	137.2	72.3	194.5	71.3	146.9	80.8	59.2	66.2
Std. Dev.	45.2	71.3	53.8	325.8	95.6	89.4	70.5	50.5	59.2
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	376.6	530.8	425.1	2128.5	650.2	632.6	556.7	421.9	521.2
Percentiles									
90	146.3	237.9	158.4	702.1	234.6	276.9	193.7	130.8	157.7
80	120.5	200.4	124.1	487.8	172.6	226.3	146.7	97.5	121.8
70	102.5	173.8	98.9	360.6	132.3	191.2	116.7	80.0	98.7
60	90.9	153.4	83.7	264.4	102.8	167.1	97.1	68.3	81.8
50	80.0	137.2	72.3	194.5	71.3	146.9	80.8	59.2	66.2
40	70.3	119.1	60.1	143.2	51.0	126.1	70.0	51.0	55.6
30	60.9	101.9	49.3	95.0	38.2	106.1	60.0	43.3	47.1
20	52.6	87.9	41.3	50.1	26.1	87.8	50.0	35.0	36.1
10	42.0	67.3	32.4	13.4	13.6	65.1	38.9	26.7	25.3

An important shortfall was observed for energy. Only 88.7% of the energy requirements were accounted for. The percentile distribution showed that the diet of at least 60% of the children did not satisfy the RDA for energy.

The situation with protein was markedly different. At least 70% of the sample was meeting the protein requirements from the daily diet. The satisfaction of iron requirements, indicated a similar profile.

3.5 Factors Associated with RDA Satisfaction

The relationship between RDA satisfaction and certain background factors, was further investigated. These factors included:

- geographic area (coastal/hilly inland)
- household farming activities

  (whether - or not any household member was engaged in farming)
- gender (male/female)
- compliance on the WFP school feeding programme

  (whether - or not the school received the WFP snack; and whether - or not the child generally participated in the programme)
- child's usual pattern of school attendance (# of days per week)

Geographic Area - On average, children in the coastal regions were better nourished than were their counterparts in the hilly inland areas (Figure 5). Differences were statistically significant for the following:

- energy
- protein
- iron
- riboflavin
- niacin

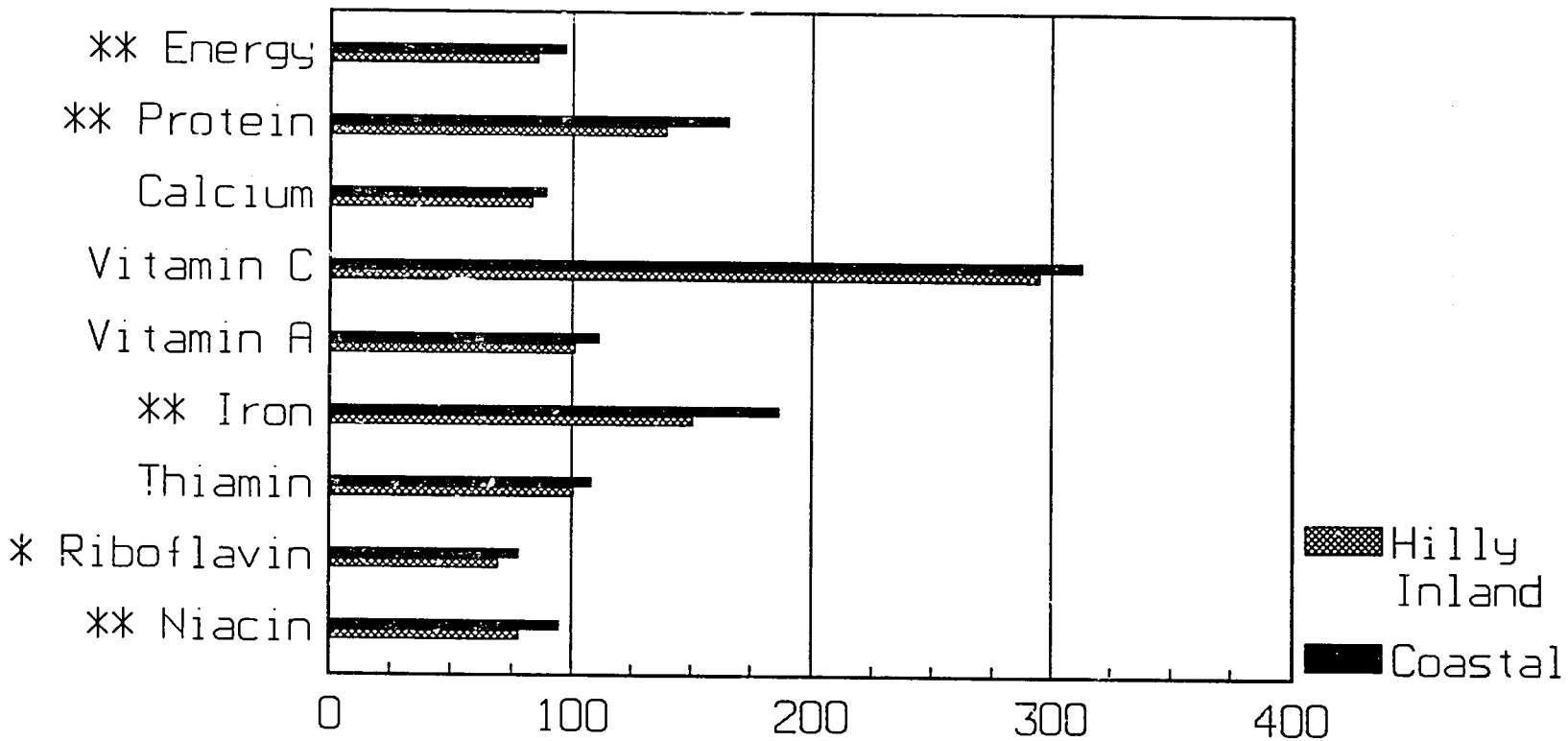
Although the mean percentage RDA satisfaction was generally low for most nutrients, the children from the hilly inland regions were at a greater disadvantage. As indicated earlier (3.1 and 3.2), there was greater variety in the food eaten by children in the coastal regions, than from that eaten by the children in the deeper rural areas. This could have had implications for the differences in nutrient intake.

This finding is further highlighted in Figure 6 for RDA satisfaction (energy) - according to categories of <50%, 50-75%, 76-100%, 100% energy requirement satisfaction.

Household Farming Activities - This variable was inter-related with "geographic area". Most households in the hilly inland areas were engaged in farming activities; while most in coastal regions were not.

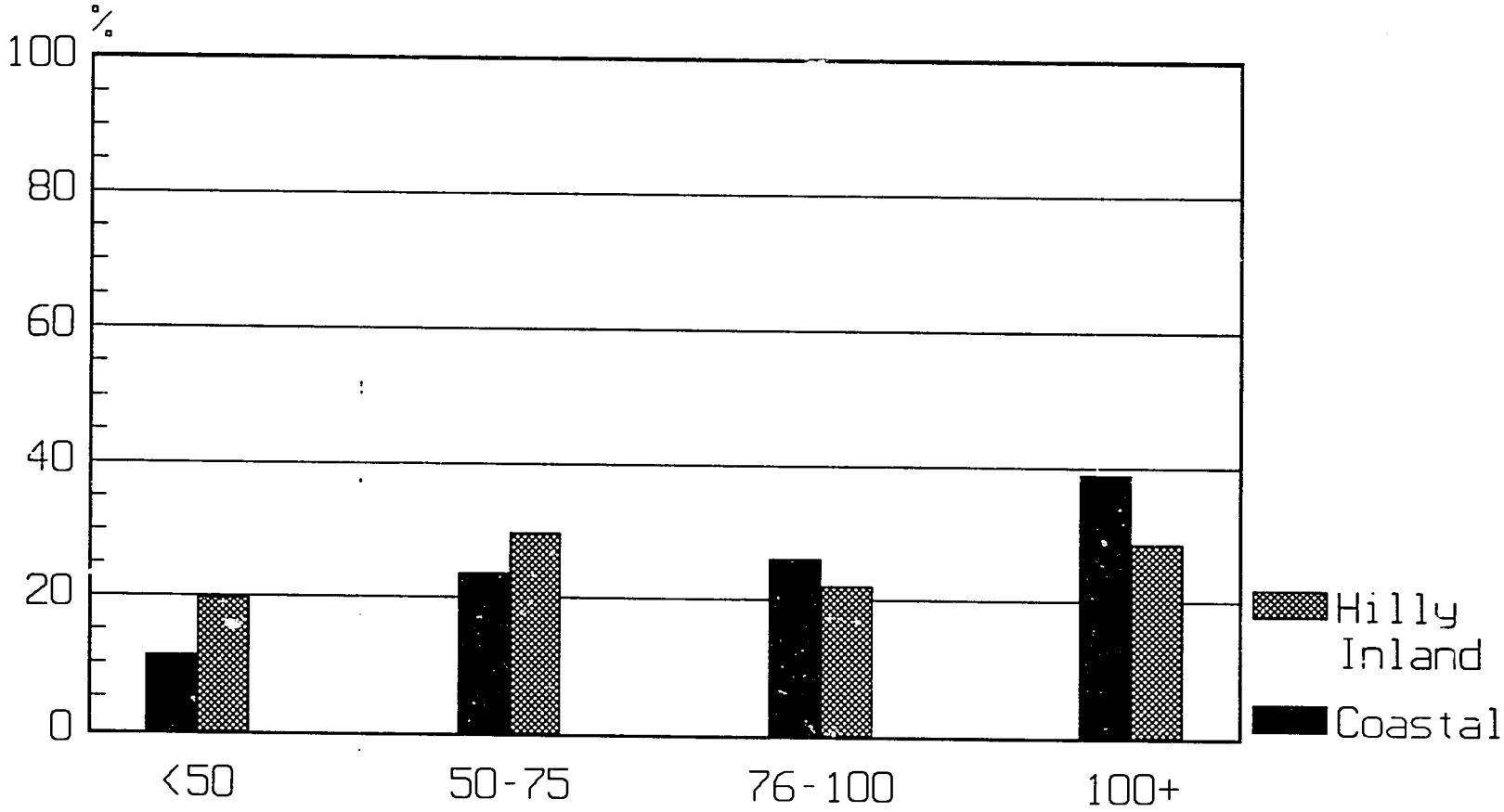
The intake of protein, calcium and niacin (Table 4) differed according to whether - or not household members were involved in farming. The direction in which they differed was not consistent. However, the relative restrictions in diet for the children from hilly inland regions, could likely be related.

FIGURE 5 Mean % RDA Satisfaction for Different Nutrients by Geographic Area



*t-test; p<.05 **t-test; p<.01

FIGURE 6: % RDA Satisfaction (Energy) by Geographic Area



Gender - Nutrient intake in respect of RDA satisfaction differed between boys and girls, for:

- vitamin C, and
- iron

In both instances, the males satisfied their requirements to a greater extent than did the females. The increased requirements of girls for iron during this period (including pubertal phase) must be noted. If there were equal intakes of iron by both sexes this would result in disparate fulfillment of iron requirements.

Compliance on WFP School Feeding Programme - The sample on which the current analyses were conducted, included children from schools with - and without the WFP school feeding programme.

Within the WFP schools, compliance on the programme was voluntary, hence the likely options were:

- child had neither bun nor milk regularly
- child had bun regularly, but not milk
- child had milk regularly, but not bun
- child had both bun and milk regularly

TABLE 4: Relative % RDA Satisfaction for Different Nutrients By (i) Household Farming Status, and (ii) Gender

NUTRIENTS		Relative % RDA Satisfaction			
		Household Farming Status		Gender	
		Yes	No	Male	Female
	N	733	315	542	513
Energy	Mean	88.3	90.0	89.4	88.1
	SD	44.0	47.9	46.8	43.4
Protein	Mean	143.6	155.2*	147.9	146.0
	SD	70.5	72.6	73.2	69.2
Calcium	Mean	87.6	79.1*	87.2	82.4
	SD	55.2	50.5	56.6	50.7
Vitamin C	Mean	312.4	274.9	325.8	272.7**
	SD	322.9	332.7	355.8	288.6
Vitamin A	Mean	105.6	99.9	106.5	101.0
	SD	95.8	95.3	100.6	90.0
Iron	Mean	159.7	165.9	167.1	155.4*
	SD	90.0	88.1	90.4	88.1
Thiamin	Mean	102.6	102.5	103.6	101.5
	SD	69.6	72.6	71.7	69.3
Riboflavin	Mean	72.3	70.9	71.8	71.7
	SD	51.1	49.4	50.4	50.7
Niacin	Mean	77.8	94.6**	82.8	82.7
	SD	55.1	66.5	61.5	56.8

*t-test; p <.05
**t-test; p <.01

The relationships between compliance on the programme, and percent RDA satisfaction, are shown in Table 5. There were significant differences for all nutrients except iron, and riboflavin.

Energy requirements were best met by children who did not participate in the programme - either because they did not want to (i.e. even though the school was a WFP school), or because the school was not on the programme.

Previous results (CFNI, 1989) had indicated that among the WFP schools, those who did not participate in the programme were from households with higher economic status (using household expenditure as a proxy). These children's regular diets were therefore likely to be richer in nutritive value than were those of the other children. The current analyses supported this somewhat higher - percent satisfaction of energy was associated with higher household expenditure levels ($r = 0.14$; $p = <.01$).

The situation with children who either ate:

- bun without milk, or
- milk without bun

was far less clear. It was previously noted (ibid, 1989) that:

- children who had "bun/no milk" regularly, were from households with the lowest mean expenditures;
- children who had "milk/no bun' regularly, were the youngest ones.

The current findings show these latter to be least well-nourished - as measured by extent of RDA satisfaction. There was no real support however, for an associated age trend.

TABLE 5: Mean % RDA Satisfaction for Different Nutrients by Compliance on School Feeding Programme

NUTRIENTS		% RDA Satisfaction by Compliance on School Feeding Programme				
		— Child —				- School -
		No bun/ No milk	Bun/ No milk	No bun/ Milk only	Bun/Milk	No bun/ No milk
	N	89	55	59	426	407
Energy**	Mean	94.3	86.4	71.4	86.3	93.5
	SD	47.8	55.4	29.7	40.9	48.8
Protein**	Mean	156.6	129.5	124.5	145.0	153.5
	SD	65.7	73.0	51.6	68.8	76.6
Calcium**	Mean	84.5	101.6	79.6	90.4	78.5
	SD	46.4	73.7	39.9	57.7	49.5
Vitamin C**	Mean	334.8	377.9	282.6	332.1	254.5
	SD	371.0	399.6	415.3	339.7	269.3
Vitamin A*	Mean	103.1	115.1	88.3	113.5	94.4
	SD	100.7	77.6	76.5	104.2	87.8
Iron	Mean	160.9	148.9	137.3	162.6	166.8
	SD	90.3	101.3	81.3	90.5	88.2
Thiamin**	Mean	107.2	85.5	74.6	95.8	115.6
	SD	67.7	59.9	50.1	61.7	81.3
Riboflavin	Mean	75.3	78.4	75.9	73.6	68.5
	SD	45.8	58.4	54.6	53.2	47.4
Niacin**	Mean	95.9	57.1	63.6	71.8	98.5
	SD	68.9	43.7	45.5	50.7	64.6

*Anova; $p < .05$
**Anova; $p < .01$

The overall pattern of nutrient intake appeared different in the current analyses, than from the previous report. Reasons could be related to sample size - which was earlier restricted to 368, and a wider geographic range in the current analysis. Iron intake and the extent to which this satisfied the requirements, was earlier shown as being much lower than now identified for the sample.

Pattern of School Attendance - Percent RDA satisfaction was shown to vary according to the usual pattern of school attendance reported for the children (Table 6). Children who were better nourished, attended school more regularly (i.e. # days per week). This was reflected in the figures for most nutrients.

The extent to which intervening variables may be operating here, is unknown. Among the questions which arise include:

- are the regular attenders better fed at home, or as a result of school attendance?
- are the irregular attenders prejudged at home to be inadequately prepared (e.g. nutritionally) to attend school regularly?
- is SES the dominant variable, especially for irregular attenders? Are these children staying home to assist (or otherwise) in impoverished situations where there is little food available anyway?
- are the irregular attenders subject to recurrent illness? If so, is this a limiting factor relating to food - and nutrient - intake? or vice-versa?

TABLE 6: Mean % RDA Satisfaction for Different Nutrients by Average Attendance at School

NUTRIENTS		% RDA Satisfaction by Average Days' (per week) School Attendance			
		2	3	4	5
	N	29	120	377	525
Energy**	Mean	76.4	82.4	84.8	93.9
	SD	46.9	41.6	41.2	48.1
Protein**	Mean	122.1	123.1	137.7	160.5
	SD	66.9	62.6	65.0	74.7
Calcium**	Mean	74.5	71.2	83.5	89.9
	SD	54.7	46.3	50.3	57.2
Vitamin C	Mean	334.3	310.8	281.2	309.7
	SD	350.2	363.9	292.2	338.6
Vitamin A	Mean	72.1	91.7	101.9	109.9
	SD	70.5	98.6	95.5	95.9
Iron**	Mean	146.0	147.2	153.6	171.4
	SD	77.7	83.0	85.2	93.4
Thiamin**	Mean	91.9	88.9	97.4	110.2
	SD	68.7	65.9	69.1	72.1
Riboflavin**	Mean	64.7	62.5	68.1	77.0
	SD	44.4	55.6	47.1	51.6
Niacin**	Mean	62.8	71.1	76.0	91.5
	SD	44.9	59.9	54.0	62.2

**Anova; $p < .01$

- if money is a major deterrent to school attendance, does it also limit the household's expenditure on food? Does this limitation (if it exists) extend to both amount, and variety of food?

The associations observed between background variables and percent RDA satisfaction, are not readily explained, and given the current data and analyses, only speculation can be applied at this point.

3.6 Energy Source/Relationships with RDA (energy) Satisfaction

The primary source of the children's energy, was "carbohydrates" (Figure 7). This supply accounted for 68% of the energy, while "fats and oils" were responsible for 20.6%, and "proteins" accounted for 11.3%. Given the high intake of staples in the diet, this finding was expected.

The relative energy sources were compared with the extent to which the recommended daily allowances for energy were satisfied (Table 7). The relative contributions of carbohydrates to the overall energy intake, were inversely proportional to the percent RDA satisfaction for energy. Those children who were adequately nourished as indicated by RDA (energy) satisfaction, were less dependent on carbohydrates as an energy source, than were those whose energy needs were not being met.

The profile for proteins was similar.

The relative contributions of fats and oils as an energy source increased, as RDA satisfaction (energy) increased. These relationships were all significant ($p < .01$ respectively).

Figure 7: Relative Sources of Energy Supplied to Children

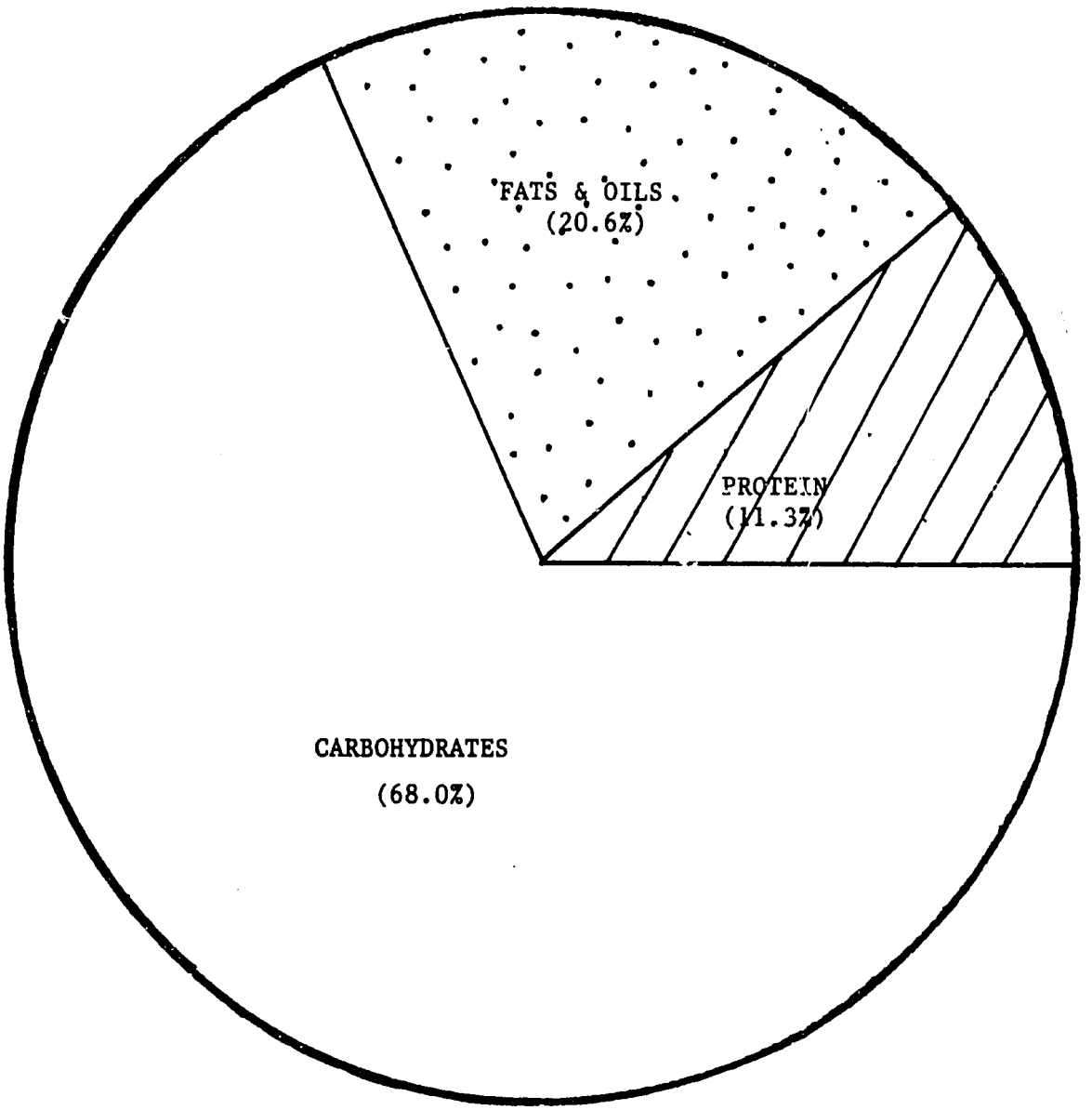


TABLE 7: Relative Sources of Energy, Supplied to Children, According to % RDA Satisfied (Energy)

% RDA Satisfied (Energy)		Relative Source (%) of Energy		
		Carbohydrates[1]	Protein[2]	Fat[3]
<50	Mean	71.0	12.0	18.5
	SD	12.4	3.5	11.2
50-75	Mean	69.7	12.1	19.3
	SD	11.0	3.2	11.0
76-100	Mean	67.2	11.2	21.3
	SD	12.0	2.9	10.5
100+	Mean	65.6	10.2	22.2
	SD	13.2	2.9	10.6
TOTAL	Mean	68.0	10.1	20.6
	SD	12.2	2.6	10.8

[1]F = 10.08; df = 3,1050; p <.01
[2]F = 27.77; df = 3,1050; p <.01
[3]F = 6.58; df = 3,1050; p <.01

Number of Food Items Within Categories - Within the different food categories discussed earlier, there were variations in the number of items eaten by children - differentiated by percent RDA satisfaction (energy). Table 8 shows statistically significant differences for:

- cereals
- sugars and syrups
- pulses, nuts and oil seeds
- fruits
- meat and poultry
- eggs

TABLE 8: Variety of Daily Intake Within Food Category - According to % RDA Satisfaction (Energy)

Food Category	% RDA Satisfaction (Energy)	NO. ITEMS (% CONSUMPTION) 0	1	2	3	4	5	6	7	Total[1]
1. Cereals	<50	3.9	28.7	41.4	20.4	5.5	-	-	-	99.9
(x^2 = 138.9; p <.01)	50 - 75	0.7	17.3	45.2	27.2	7.8	1.7	-	-	99.9
	76 - 100	0.4	11.8	35.8	33.7	13.4	4.1	0.8	-	100.0
	100+	0.3	6.3	29.9	34.1	20.4	7.5	1.2	0.3	100.0
	Total	**1.0**	**14.5**	**37.5**	**29.8**	**12.7**	**3.8**	**0.6**	**0.1**	100.0
2. Starchy Fruits, Roots	<50	29.3	40.9	24.9	3.3	1.7	-	-	-	100.1
& Tubers	50 - 75	20.4	40.8	29.3	8.2	1.0	0.3	-	-	100.0
(x^2 = 23.0; n.s.)	76 - 100	23.6	42.3	20.3	11.4	2.4	-	-	-	100.0
	100+	27.5	35.3	26.9	8.4	1.5	0.3	-	-	99.9
	Total	**24.9**	**39.4**	**25.7**	**8.2**	**1.6**	**0.2**	-	-	100.0
3. Sugars and Syrups	<50	8.8	87.8	2.8	0.6	-	-	-	-	100.0
(x^2 = 32.2; p <.01)	50 - 75	8.2	88 1	3.4	0.3	-	-	-	-	100.0
	76 - 100	5.7	89.0	4.9	0.4	-	-	-	-	100.0
	100+	4.8	82.3	12.3	0.6	-	-	-	-	100.0
	Total	**6.6**	**86.4**	**6.4**	**0.5**	-	-	-	-	99.9
4. Pulses, Nuts and Oil	<50	82.9	12.2	5.0	-	-	-	-	-	100.1
Seeds	50 - 75	85.7	9.5	4.8	-	-	-	-	-	100.0
(x^2 = 64.5; p <.01)	76 - 100	73.6	19.9	5.3	1.2	-	-	-	-	100.0
	100+	61.4	24.0	13.5	1.2	-	-	-	-	100.1
	Total	**74.7**	**17.0**	**7.7**	**0.7**	-	-	-	-	100.1
5. Vegetables	<50	62.4	28.7	7.2	-	1.7	-	-	-	100.0
(x^2 = 18.3; n.s.)	50 - 75	57.1	28.9	8.2	3.7	1.4	0.7	-	-	100.0
	76 - 100	54.1	32.9	8.1	3.3	1.2	0.4	-	-	100.0
	100+	53.9	26.9	12.9	4.2	1.5	0.6	-	-	100.0
	Total	**56.3**	**29.2**	**9.5**	**3.1**	**1.4**	**0.5**	-	-	100.0
6. Fruits	<50	71.3	23.2	5.0	0.6	-	-	-	-	100.1
(x^2 = 22.5; p <.01)	50- 75	62.9	32.7	3.1	1.4	-	-	-	-	100.1
	76 - 100	63.4	29.7	4.9	2.0	-	-	-	-	100.0
	100+	58.4	30.8	9.9	0.9	-	-	-	-	100.0
	Total	**63.0**	**29.8**	**6.0**	**1.2**	-	-	-	-	100.0

Food Category	% RDA Satisfaction (Energy)	NO. ITEMS (% CONSUMPTION) 0	1	2	3	4	5	6	7	Total[1]
7. Meats & Poultry	<50	40.9	55.8	3.3	-	-	-	-	-	100.0
(x^2 = 69.9; p <.01)	50 - 75	25.2	67.0	7.5	0.3	-	-	-	-	100.0
	76 - 100	19.9	70.3	8.9	0.8	-	-	-	-	99.9
	100+	17.7	62.6	17.4	2.1	0.3	-	-	-	100.1
	Total	**24.3**	**64.5**	**10.2**	**0.9**	**0.1**	-	-	-	100.0
8. Eggs	<50	91.2	8.8	-	-	-	-	-	-	100.0
(x^2 = 27.0; p <.01)	50-75	79.9	20.1	-	-	-	-	-	-	100.0
	76 - 100	74.0	26.0	-	-	-	-	-	-	100.0
	100+	73.7	26.0	0.3	-	-	-	-	-	100.0
	Total	**78.5**	**21.4**	**0.1**	-	-	-	-	-	100.0
9. Fish and Shell Fish	<50	80.7	18.8	0.6	-	-	-	-	-	100.1
(x^2 = 2.4; n.s.)	50-75	77.2	20.7	2.0	-	-	-	-	-	99.9
	76 - 100	76.8	21.5	1.6	-	-	-	-	-	99.9
	100+	76.9	21.3	1.8	-	-	-	-	-	100.0
	Total	**77.6**	**20.8**	**1.6**	-	-	-	-	-	100.0
10. Milk & Milk Products	<50	33.7	50.3	14.4	1.7	-	-	-	-	100.1
(x^2 = 21.4; p <.05)	50 - 75	25.9	57.1	15.6	1.0	0.3	-	-	-	100.0
	76 - 100	22.8	57.3	17.9	2.0	-	-	-	-	100.0
	100+	18.9	56.6	21.3	2.7	0.6	-	-	-	100.0
	Total	**24.3**	**55.8**	**17.7**	**1.9**	**0.3**	-	-	-	100.1
11. Fats and Oils	<50	47.0	40.9	11.6	0.6	-	-	-	-	100.1
(x^2 = 130.6; p <.01)	50 - 75	43.2	42.2	13.3	1.0	0.3	-	-	-	100.0
	76 - 100	28.5	44.7	21.5	5.3	-	-	-	-	99.9
	100+	14.4	43.1	32.6	9.6	0.3	-	-	-	100.0
	Total	**31.3**	**42.8**	**21.0**	**4.6**	**0.2**	-	-	-	100.1
12. Miscellaneous Food	<50	58.0	37.0	5.0	-	-	-	-	-	100.0
(x^2 = 29.2; p <.01)	50-75	48.0	43.2	7.8	1.0	-	-	-	-	100.0
	76 - 100	45.1	45.9	8.5	-	0.4	-	-	-	99.9
	100+	38.3	48.5	12.3	0.9	-	-	-	-	100.0
	Total	**46.0**	**44.5**	**8.9**	**0.6**	**0.1**	-	-	-	100.1

Totals may not add to 100.0 due to rounding.

- milk and milk products
- fats and oils
- miscellaneous foods

In general, the following trends could be applied to the (statistically significant) item - profiles, regardless of which type(s) of foods were being assessed:

- the likelihood of children having eaten zero (0) items from a food category increased as their percent RDA satisfaction decreased.
- the greater the extent to which RDA (energy) requirements were satisfied, the greater the variety of food items within each food category was likely to be.

Contributions of Different Foods to Energy - The well nourished children had different dietary intake patterns from those children who were less adequately nourished (Table 9). Certain food categories indicated where the main differences existed for energy intake:

- cereals
- starchy fruits, roots and tubers
- pulses, nuts and oil seeds
- fats and oils

Starchy fruits, roots and tubers contributed significantly more ($p < .01$) to energy intake for the less adequately nourished children, than for the well nourished ones. However, within the other food categories mentioned above the profile was reversed.

TABLE 9: Proportion of Calories from Different Foods, According to % RDA Satisfaction (energy)

FOOD CATEGORIES		% RDA Satisfaction (Energy)					LEVEL OF SIGNIFICANCE[1] (ANOVA)
		<50	50-75	76-100	100	Total	
	N	180	294	246	334	1054	
1. Cereals	Mean	43.6	47.2	47.5	49.0	47.2	F = 3.48; p<.05
	SD	20.1	16.8	17.9	18.3	18.2	
2. Starchy Fruits, Roots & Tubers	Mean	15.3	12.1	8.9	5.7	9.9	F = 28.37;p<.01
	SD	19.4	12.4	10.7	7.4	12.8	
3. Sugars and Syrups	Mean	11.5	10.0	10.2	11.1	10.6	F = 1.22; n.s.
	SD	9.4	8.5	9.7	11.9	10.1	
4. Pulses, Nuts and Oil Seeds	Mean	2.1	1.2	2.5	4.1	2.6	F = 11.33; p<.01
	SD	6.0	3.5	7.6	7.8	6.6	
7. Meat & Poultry	Mean	6.3	8.1	7.7	7.7	7.6	F = 1.82; n.s.
	SD	8.4	8.5	8.4	8.5	8.5	
8. Eggs	Mean	0.7	1.1	1.1	0.7	0.9	F = 2.54; n.s.
	SD	2.3	2.3	2.1	1.5	2.0	
9. Fish & Shell Fish	Mean	1.3	1.7	1.5	1.2	1.4	F = 0.93; n.s.
	SD	3.6	4.7	3.5	4.6	4.2	
10. Milk & Milk Products	Mean	6.8	5.7	5.8	5.8	5.9	F = 0.91; n.s.
	SD	8.3	7.9	7.3	7.4	7.7	
11. Fats & Oils	Mean	7.1	6.1	8.5	9.3	7.8	F = 5.83; p<.01
	SD	10.3	8.8	11.5	10.3	10.3	

[1]df = 3,1050

3.7 Protein and Iron Sources/Relationships with RDA (Energy) Satisfaction

The relative sources of both protein and iron in the children's diet were investigated by using the same index - percent RDA satisfaction (energy).

Protein sources were included in the diets to different degrees (Table 10) for:

- cereals
- starchy fruits, roots and tubers
- pulses, nuts and oil seeds
- milk and milk products
- fats and oils

The children who were less adequately nourished depended more on:

- starchy fruits, roots and tubers; and
- milk and milk products

for their proteins, than did the well nourished ones. Cereals and pulses provided a greater proportion of proteins to the better-nourished children, than to the lesser-nourished children.

For the children whose energy requirements were adequately met, there was significantly more iron in the diets (Table 11) from

- cereals; and
- pulses, nuts and oil seeds

than for the children who were not meeting their energy intake requirements.

TABLE 10: Proportion of Protein from Different Foods, According to % RDA Satisfaction (Energy)

FOOD CATEGORIES		% RDA Satisfaction (Energy)					LEVEL OF SIGNIFICANCE[1] (ANOVA)
		<50	50-75	76-100	100+	Total	
	N	180	294	246	334	1054	
1. Cereals	Mean	42.3	45.5	46.5	49.2	46.4	F = 5.57; p<.01
	SD	22.6	18.1	17.6	17.9	18.9	
2. Starchy Fruits, Roots & Tubers	Mean	11.3	8.2	6.6	4.1	7.1	F = 18.95; p<.01
	SD	17.4	9.2	10.6	6.6	11.0	
3. Sugars and Syrups	Mean	0.0	0.0	0.1	0.1	0.0	F = 0.91; n.s.
	SD	0.4	0.0	0.6	0.7	0.5	
4. Pulses, Nuts and Oil Seeds	Mean	3.4	1.8	3.6	6.3	3.9	F = 14.07; p<.01
	SD	9.8	5.5	8.0	10.8	8.9	
7. Meat & Poultry	Mean	18.0	20.8	19.2	18.8	19.3	F = 1.12; n.s.
	SD	21.7	18.1	16.4	14.8	17.4	
8. Eggs	Mean	1.6	2.7	2.9	2.2	2.4	F = 2.37; n.s.
	SD	5.4	5.8	5.6	4.4	5.3	
9. Fish & Shell Fish	Mean	3.8	5.2	4.9	3.4	4.3	F = 1.73; n.s.
	SD	10.1	12.8	11.8	9.1	11.1	
10. Milk & Milk Products	Mean	14.1	9.8	9.8	9.8	10.5	F = 3.99; p<.01
	SD	20.8	14.9	13.9	12.2	15.2	
11. Fats & Oils	Mean	0.1	0.1	0.1	0.2	0.1	F = 3.11; p<.05
	SD	0.3	0.1	0.5	1.1	0.7	

[1]df = 3,1050

Table 11: Proportion of Iron from Different Foods, According to % RDA Satisfaction (energy)

FOOD CATEGORIES		% RDA Satisfaction (Energy)					LEVEL OF SIGNIFICANCE[1] (ANOVA)
		<50	50-75	76-100	100+	Total	
	N	180	294	246	334	1054	
1. Cereals	Mean	32.4	36.6	38.6	41.2	37.8	F = 9.36; p<.01
	SD	19.4	17.6	18.0	19.2	18.7	
2. Starchy Fruits, Roots & Tubers	Mean	18.6	15.0	11.6	7.9	12.6	F = 24.77; p<.01
	SD	21.8	14.8	13.1	10.1	15.1	
3. Sugars and Syrups	Mean	17.0	14.1	15.5	16.1	15.6	F = 1.92; n.s.
	SD	13.6	11.7	13.7	15.4	13.8	
4. Pulses, Nuts and Oil Seeds	Mean	4.5	2.8	4.9	8.5	5.4	F = 14.06; p<.01
	SD	12.0	7.9	10.6	14.0	11.6	
7. Meat & Poultry	Mean	9.2	11.0	10.2	10.1	10.2	F = 1.09; n.s.
	SD	12.3	10.8	9.6	9.3	10.4	
8. Eggs	Mean	1.3	2.3	2.7	1.8	2.1	F = 3.46; p<.05
	SD	4.6	5.0	5.4	3.6	4.7	
9. Fish & Shell Fish	Mean	1.8	2.2	1.2	1.1	1.6	F = 2.21; n.s.
	SD	5.7	8.2	3.9	5.0	6.0	
10. Milk & Milk Products	Mean	2.6	1.5	1.4	1.5	1.6	F = 5.69; p<.01
	SD	4.7	3.1	2.4	3.2	3.4	

[1]df = 3,1050

Starchy fruits, roots and tubers contributed significantly to iron intake, especially for the lesser-nourished children.

The extent to which specific food items were contributing to the energy, protein, and iron supplies in the diet was assessed (Appendix II). The items selected for analysis were among those most frequently consumed by the sample. These analyses were conducted with reference to the percent RDA satisfaction (energy).

As expected, there were significant variations between groups, for the intake/ contributions of the staples, including:

- counter flour/medium wheat flour
- bread
- yam
- green banana
- breadfruit

There were also differences in contributions of chicken to the diet - both the necks/backs, and the dressed version. It must be noted however, that the overall frequency of consumption for dressed chicken, was quite low - (10.9%).

3.8 Limitations to Study

The current study was subject to certain limiting factors. Among the more important ones were:

1. The data comprised a single 24-hour recall for each child; as compared with a more ideal "several" sequential recall days;

2. The accessible data on nutritional status were inadequate for detailed analyses here.
3. Further analysis of the data at the level of food items was somewhat restricted by (a) the large size (number of units) of the data set, and (b) the limitations of resources to allow for further manipulation of the same.
4. The restrictions in #3 extended to analyses at the level of origin of food items.
5. Food items consumed more than once by the children in the 24-hour period were combined (to contain the size of the data set) hence it was not possible to determine the relative frequency of consumption of individual food items on a daily basis.

DISCUSSION

The current study has highlighted important patterns of food consumption and nutritional intake among an older group of children than that usually studied in Jamaica. Although certain limitations were applied to the analyses, the scope for further, more detailed work has now been more clearly identified.

The median number of items eaten by the sample was 10. This is lower than the 12 (for ages 1-3 years) and 17 (for ages 3-6 years) found by Fox et al (1968). The earlier study was conducted:

a) on younger children, and

b) in both urban and rural areas.

The difference in these factors (including time lag) is no doubt associated with the differences in item consumption - as compared with the current findings.

The relative importance of geographic location has again been shown here, as it pertains to food consumption patterns. An increased variety of food items tends to be available in the low-lying coastal regions - usually replete with central marketplaces. Distribution of goods and services is far greater to these locations, due to easier access, greater population density, and increased concentration of industries and general economic activities. The same agricultural produce grown in the hilly inland regional is also marketed in the coastal areas.

The effects of living in the coastal regions therefore, seem to include increased variety in food items consumed, better nutrient intake, and improved nutritional status.

Foods Consumed

Cereals represented the highest proportion in the schoolchildren's diets. All of our cereals are of foreign origin - even if some of the processing occurs here. This has significant implications at the monetary level - not only for individual household consumption, but also in reference to national expenditures on cereal imports.

Starchy foods, which include those items, e.g. yams grown in the immediate area, were consumed to a far lesser degree. It is ironic that six of the schools studied were located in Trelawny, the parish known for its production of yams.

Many of the areas were very involved in small farming activities which extended beyond yam production. Despite this, the intake of food items such as pulses and nuts, vegetables, fruits, and eggs, was quite low for the sample. It must further be remembered that these 24-hour recalls included weekends; and Sundays are renown in Jamaica for the favourite "rice and peas" dish. This dish is not generally consumed throughout the weekdays; hence the proportion of pulses would likely have been less, if Sundays had been omitted from the analyses.

The concepts of "appropriate nutritional purchases", and "value for money" are worthy of consideration, especially as they relate to the high consumption of items such as condensed milk. It appears quite likely that taste preferences are of greater importance in the purchase and consumption of certain items, than the concepts mentioned above. Whether or not households can afford to maintain these taste preferences, given the changing economic climate, remains to be seen.

It is quite possible that taste preferences are also of some importance in relationship to:

- low intake of cornmeal
- low intake of dried skimmed milk
- low intake of canned fish

This may exist whether or not the items are regarded as being "good buys".

Nutrient Intake

Almost one-half (½) of the calorie intake for these children (47.3%) was from cereals. When combined with calorie intake from sugars (10.7%), the total (58%) was actually very close to that found (nearly 60%) by Fox et al (1968) for the same categories. As was found then, energy requirements were still not being met completely.

The relatively high degrees to which protein requirements were met, were reminiscent of the Louisiana study (Frank et al, 1977). The RDAs (protein) were met by approximately 70% of the study children. The highest proportions of protein here, were from cereals (46.4%), with "meats and poultry" providing approximately 20%, and "milk and milk products" giving 10.4%. The relatively high unit costs for meat and poultry, was likely to have been a significant factor contributing to these proportions. Once again, with the changing food costs, it would be important to determine how these food categories now relate in their contributions to protein intake.

It was noted by Walker (1988) that chicken (in all forms) was very frequently used. Within the food category i.e. "meat and poultry", the same was true here. Chicken meat

accounted for some 5% of the total items consumed. Beef and pork products were had to a lesser degree.

School-Related Factors

The relative shortfall in energy, is an important factor for consideration. The dietary intake of the rural schoolchildren seems inadequate to supply the RDAs (energy) of some 60-70% of the children. Despite the high levels of cereals, and relatively high levels of starchy foods, the energy requirements of these children are not being met.

One important source is not being fully accessed as far as the diets are concerned - that of "pulses, nuts and oil seeds". Some of the food items therein are relatively easy to produce, especially in households in the agricultural areas.

The demands for energy among rural schoolchildren in Jamaica, are quite high. Limited household funds, coupled with inadequate transportation, mean that many children walk to and from school. The previous report on the school feeding programme (CFNI, 1989) further indicated that these children sometimes have many hours of household-type duties to perform - in addition to the requirements of school. The manner in which these various factors are interrelated, in the context of an adequate learning environment, and preparedness for the same, seems to be an area for further study. Low levels of achievement currently being observed, could possibly be related to inadequate nutrient intake.

Further Study

Among the areas in which further study is indicated, are:

1. Household patterns of expenditure, as they relate to dietary intake, and nutritional value of foods purchased and consumed.
2. Relationships between dietary intake patterns, school achievement, the learning processes, and energy requirements and usage.
3. Factors involved in the maintenance of "expensive" taste preferences, despite economic hardships; the processes required to effect suitable changes; and the likely nutritional impact of such changes.

APPENDICES

Detailed Listing of Food Items Consumed By Food Category and Origin of Items

1. CEREALS		
FOOD AND DESCRIPTION	**FREQUENCY**	**% of Children**
• Wheat - Flour, counter	714	6.4
• Wheat - Bread, unenriched white	631	5.7
• Rice -	528	4.8
• Wheat - Flour, medium	194	1.8
• Corn - Cornmeal	156	1.4
• Wheat - Biscuits	112	1.0
• Wheat - Crackers	106	1.0
• Corn - whole kernel	51	0.4
• Wheat - Breadcrumbs	45	0.4
• Wheat - Cake, plain	44	0.4
• Wheat - spaghetti, macaroni	19	0.2
• Oats - Oatmeal or rolled oats	18	0.2
• Wheat - Bread, enriched white	18	0.2
• Corn - Kernels on cob	17	0.2
• Wheat - Cake, fruit	7	0.1
SUB-TOTAL	**2660**	**24.2**

2. STARCHY FRUITS, ROOTS & TUBERS		
FOOD AND DESCRIPTION	**FREQUENCY**	**% of Children**
• Yam, yampie - Fresh	561	5.1
• Banana - Green	351	3.2
• Breadfruit - Fresh fruit	119	1.1
• Plantain - Ripe	114	1.0
• Potato, sweet - Fresh	72	0.7
• Coco, Dasheen, Taro - Fresh tuber	48	0.4
• Potato, Irish - Fresh tuber	45	0.4
• Banana - Ripe	16	0.1
• Plantain - Green	8	0.1
SUB-TOTAL	**1334**	**12.1**
3. SUGARS AND SYRUPS		
• Sugars - Dark brown, crude	998	9.0
• Syrups - Cane	71	0.6
• Sugarcane juice	9	0.1
• Jams and preserves	6	0.1
SUB-TOTAL	**1084**	**9.8**
4. PULSES, NUTS & OIL SEEDS		
• Beans - Red peas, kidney bean	233	2.1
• Treenuts - Coconut milk	91	0.8
• Beans - Broad beans	10	0.1
• Treenuts - Coconut , mature	7	0.1
• Treenuts - Coconut, meat, dried	6	0.1
SUB-TOTAL	**347**	**3.2**

5. VEGETABLES		
FOOD AND DESCRIPTION	**FREQUENCY**	**% of Children**
• Green leafy & yellow - Cabbage	156	1.4
• Other - Tomato, ripe	116	1.0
• Green leafy & yellow - Carrot	107	1.0
• Green leafy & yellow - Callaloo	100	0.9
• Green leafy & yellow - Pumpkin	51	0.5
• Green leafy & yellow - chccho	33	0.3
• Other - Cucumber, fresh	25	0.2
• Green leafy & yellow - mixed vegetables	21	0.2
• Other - Celery	19	0.2
• Other - Ackee	16	0.1
• Other - Onion	13	0.1
• Green leafy & yellow - Carrot, canned	8	0.1
• Green leafy & yellow - Pepper, sweet	7	0.1
• Green leafy & yellow - Carrot, juice	7	0.1
• Green leafy yellow - Beans, snap, string	6	0.1
• Other - Ginger	6	0.1
SUB-TOTAL	**691**	**6.4**
6. FRUITS		
• Other - Mango, ripe	214	1.9
• Citrus fruits - Limes, juice	141	1.3
• Other - Apple, fresh; Malacca apple; Otaheite apple	53	0.4
• Citrus Fruits - Oranges, peeled	29	0.3
• Other - Soursop	19	0.2
• Other - Pineapple, raw	7	0.1
SUB-TOTAL	**463**	**4.2**

7. MEAT AND POULTRY		
FOOD AND DESCRIPTION	**FREQUENCY**	**% of Children**
• Poultry - Chicken, neck and back	314	2.8
• Poultry - Chicken, dressed, mature/young, cut-up parts	240	2.2
• Beef - Whole carcass, medium	88	0.8
• Beef - Whole carcass, thin	65	0.6
• Pork - Whole carcass, thin	65	0.6
• Pork - Whole carcass, fat	38	0.3
• Offals - Liver, raw, beef	19	0.2
• Pork - Sausage	18	0.2
• Poultry - Turkey, dressed	13	0.1
• Beef - Corned, canned	12	0.1
• Beef - Corned, uncooked	10	0.1
• Beef - Sausages, bologna	7	0.1
• Mutton & Lamb - Whole carcass, thin	7	0.1
• Offals - Intestine, beef	7	0.1
• Offals - Kidney, beef	7	0.1
SUB-TOTAL	**910**	**8.4**
8. EGGS		
• Hen - Fresh eggs, whole	235	2.1
SUB-TOTAL	**235**	**2.1**

9. FISH AND SHELL FISH		
FOOD AND DESCRIPTION	**FREQUENCY**	**% of Children**
• Fish, raw - Mackerel, canned	80	0.7
• Fish, raw - Mackerel, salted	50	0.5
• Fish, raw - Fish sticks, frozen, cooked	33	0.3
• Fish, raw - Sardine	33	0.3
• Fish, raw - Fresh fish (variety)	16	0.1
• Fish, raw - Sardine, canned, in oil	15	0.1
• Fish, raw - Herring, canned, in tomato sauce	9	0.1
• Fish, raw - Herring, smoked, kippered	8	0.1
SUB-TOTAL	**244**	**2.2**
10. MILK AND MILK PRODUCTS		
• Milk, cow - Canned, condensed, sweetened	623	5.6
• Milk, cow - Dry, skim, fortified	214	1.9
• Milk, cow - Fluid, whole	96	0.9
• Milk, cow - Cheese, hard, whole milk	77	0.7
• Milk, cow - Fluid, skim	41	0.4
• Milk, cow - Dry, whole	28	0.3
• Milk, cow - Cheese, semi-soft, skim milk	17	0.2
• Commercial Milk Preparations - Horlicks, malted milk powder	15	0.1
• Milk, cow - Ice cream, cones	6	0.1
SUB-TOTAL	**1117**	**10.2**

11. FATS AND OILS		
FOOD AND DESCRIPTION	**FREQUENCY**	**% of Children**
• Oil, pure, all kinds	416	3.8
• Butter	305	2.8
• Butter oil	215	1.9
• Shortening, vegetable	86	0.8
• Margarine, fortified	25	0.2
• Lard, leaf fat	22	0.2
SUB-TOTAL	**1069**	**9.7**
12. MISCELLANEOUS FOODS		
• Beverage and Drinks - Beverage, cocoa, dry powder	275	2.5
• Mixed Ready Foods - Soup, vegetable with meat broth	149	1.3
• Beverage and Drinks - Commercial, 'Milo'	127	1.1
• Mixed Ready Foods - Soup, chicken noodle	34	0.3
• Beverage and Drinks - Coffee, instant, dry	29	0.3
• Beverage and Drinks - Carbonated soft drinks	27	0.2
• Beverage and Drinks - Chocolate, sweetened	12	0.1
• Beverage and Drinks - Alcoholic drinks, beer, stout	9	0.1
• Spices and Condiments - Tamarind	8	0.1
• Spices and Condiments - Curry powder	6	0.1
SUB-TOTAL	**676**	**6.1**

APPENDIX II

Relative Contributions of Different Food Items to Energy, Protein and Iron Intake - by % RDA Satisfaction (Energy)

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	10.8	-	15.4
		SD	9.7		12.7
Sugar	<50	Mean	12.2	-	17.7
		SD	9.1		12.6
	50-75	Mean	10.5	-	14.7
		SD	8.2		11.1
	76-100	Mean	10.2	-	15.1
		SD	9.2		12.0
	100+	Mean	10.6	-	15.1
		SD	11.4		14.4
			F = 1.5; n.s.)		(F = 2.1; n.s.)
	Total	Mean	23.3	24.6	24.3
		SD	15.9	16.6	15.9
Flour, Counter	<50	Mean	23.0	24.4	23.2
		SD	17.3	19.5	17.0
	50-75	Mean	28.8	29.1	29.2
		SD	15.7	16.8	16.1
	76-100	Mean	22.1	23.1	23.3
		SD	15.2	15.8	15.1
	100+	Mean	19.3	21.6	21.0
		SD	14.7	15.7	14.9
			(F = 13.6; p<.01)	(F = 7.9; p<.01)	(F = 10.3; p<.01)

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	20.0	22.4	9.8
		SD	12.3	13.3	8.1
Bread	<50	Mean	27.4	29.6	13.3
		SD	13.0	16.0	9.2
	50-75	Mean	23.7	24.8	11.5
		SD	12.5	13.4	9.7
	76-100	Mean	19.5	22.1	9.5
		SD	10.8	12.4	6.7
	100+	Mean	14.3	17.8	7.2
		SD	10.0	10.8	7.1
			(F = 34.9; p<.01)	(F = 19.6; p<.01)	(F = 14.3; p<.01)
	Total	Mean	6.0	5.7	0.7
		SD	6.8	7.0	1.1
Condensed Milk	<50	Mean	6.5	5.8	0.7
		SD	5.7	5.9	0.7
	50-75	Mean	5.8	5.1	0.7
		SD	6.9	6.4	1.4
	76-100	Mean	6.0	5.7	0.7
		SD	7.1	7.1	0.9
	100+	Mean	5.8	6.2	0.7
		SD	6.9	7.8	1.1
			(F = 0.2; n.s.)	(F = 0.8; n.s.)	(F = 0.1; n.s.)

APPENDIX II (Cont'd)

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	10.5	8.9	12.1
		SD	11.8	10.1	12.4
Yam	<50	Mean	16.7	14.0	18.3
		SD	18.0	16.0	18.9
	50-75	Mean	12.0	9.7	13.6
		SD	11.5	9.4	12.9
	76-100	Mean	9.4	8.5	11.5
		SD	8.9	9.1	10.5
	100+	Mean	5.9	5.5	7.3
		SD	6.3	6.7	7.5
		Mean SD	(F = 19.1; p<.01)	(F = 13.8; p<.01)	(F = 16.0; p<.01)
	Total	Mean	24.7	19.5	19.2
		SD	16.7	14.9	14.0
Rice	<50	Mean	24.0	16.5	16.7
		SD	14.9	11.4	10.3
	50-75	Mean	17.3	12.1	12.6
		SD	10.7	9.0	10.3
	76-100	Mean	23.0	18.0	18.1
		SD	17.8	15.4	15.5
	100+	Mean	29.6	25.1	23.8
		SD	17.5	15.8	15.6
			(F = 13.7; p<.01)	(F = 21.0; p<.01)	(F = 15.3; p<.01)

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	11.0	-	-
		SD	9.6		
Oils, All kinds	<50	Mean	12.1	-	-
		SD	9.0		
	50-75	Mean	13.3	-	-
		SD	9.4		
	76-100	Mean	12.2	-	-
		SD	12.4		
	100+	Mean	9.4	-	-
		SD	8.1		
			(F = 4.0; p<.01)		
	Total	Mean	6.9	3.5	8.5
		SD	6.0	3.8	6.9
Green Banana	<50	Mean	11.2	5.8	12.5
		SD	7.8	6.0	7.3
	50-75	Mean	7.8	3.8	9.3
		SD	6.3	3.3	7.5
	76-100	Mean	6.1	3.0	8.0
		SD	3.8	2.1	5.2
	100+	Mean	4.3	2.3	5.9
		SD	4.4	3.2	5.9
			(F = 19.3; p<.01)	(F = 11.5; p<.01)	(F = 12.4; p<.01)

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	6.6	22.2	11.1
		SD	5.8	13.8	7.6
Chicken, Necks & Backs	<50	Mean	8.4	27.9	13.1
		SD	6.5	19.1	9.4
	50-75	Mean	7.3	24.2	12.7
		SD	4.2	14.0	7.4
	76-100	Mean	5.7	20.5	10.5
		SD	3.9	12.5	7.4
	100+	Mean	5.6	18.4	8.8
		SD	7.6	10.9	6.2
			F = 3.6; p<.05)	(F = 6.0; p<.01)	(F = 5.6; p<.01)
	Total	Mean	4.6	0.2	-
		SD	6.7	0.5	
Butter	<50	Mean	4.8	0.2	-
		SD	5.4	0.2	
	50-75	Mean	4.4	0.1	-
		SD	6.2	0.2	
	76-100	Mean	5.6	0.3	-
		SD	7.8	0.9	
	100+	Mean	4.2	0.2	-
		SD	6.6	0.3	
			(F = 0.7; n.s.)	(F = 1.7; n.s.)	

APPENDIX II (Cont'd)

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	7.0	0.1	-
		SD	5.1	0.0	-
Butteroil	<50	Mean	13.3	0.2	-
		SD	7.0	0.1	-
	50-75	Mean	7.2	0.1	-
		SD	3.2	0.0	-
	76-100	Mean	5.9	0.1	-
		SD	2.3	0.0	-
	100+	Mean	4.0	0.1	-
		SD	2.6	0.1	-
			(F = 49.3; p<.01)	(F = 26.9; p<.01)	-
	Total	Mean	8.3	15.4	21.2
		SD	9.8	11.5	13.5
Red peas	<50	Mean	9.8	19.6	24.8
		SD	9.2	16.0	16.8
	50-75	Mean	6.5	12.9	19.6
		SD	4.3	8.4	10.3
	76-100	Mean	8.2	12.9	18.5
		SD	12.9	9.9	12.8
	100+	Mean	8.6	16.4	22.3
		SD	9.4	11.5	13.6
			(F = 0.6; n.s.)	(F = 2.9; p<.05)	(F = 1.7; n.s.

APPENDIX II (Cont'd)

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	7.7	27.5	4.3
		SD	5.3	14.9	4.0
Dried Skim Milk	<50	Mean	14.6	44.4	8.9
		SD	7.1	16.6	5.7
	50-75	Mean	8.0	28.3	4.3
		SD	3.3	10.2	2.6
	76-100	Mean	6.5	25.5	3.6
		SD	2.5	11.6	3.0
	100+	Mean	4.1	18.4	2.2
		SD	1.6	9.4	1.3
			(F = 64.4; p<.01)	(F = 41.6; p<.01)	(F = 37.5; p<.01)
	Total	Mean	9.4	3.7	18.8
		SD	9.7	5.3	16.7
Mango	<50	Mean	13.0	5.3	24.4
		SD	7.8	6.4	13.6
	50-75	Mean	11.3	4.4	21.7
		SD	13.1	6.8	18.8
	76-100	Mean	8.4	3.2	18.4
		SD	7.4	3.9	16.1
	100+	Mean	6.6	2.9	14.7
		SD	7.7	4.0	15.8
			(F = 4.3; p<.01)	(F = 1.7; n.s.)	(F = 2.8; p<.05)

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	13.9		8.3
		SD	7.6		6.5
Flour, Medium Wheat	<50	Mean	26.1		17.0
		SD	7.9		8.3
	50-75	Mean	16.1		9.1
		SD	2.4		4.1
	76-100	Mean	11.6		6.8
		SD	1.3		4.3
	100+	Mean	7.3		4.1
		SD	1.8		1.8
			(F = 194.7; p<.01)		(F = 56.5; p<.01)
	Total	Mean	9.7	9.7	8.2
		SD	11.1	12.8	9.8
Cornmeal	<50	Mean	14.3	16.4	11.5
		SD	15.2	22.4	12.9
	50-75	Mean	10.9	9.8	9.1
		SD	12.0	11.9	10.9
	76-100	Mean	6.1	5.5	5.2
		SD	3.6	3.2	3.4
	100+	Mean	9.1	9.7	8.0
		SD	11.0	12.4	9.9
			(F = 2.4; n.s.)	(F = 2.8; p<.05)	(F = 1.8; n.s.

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	0.6	1.7	1.7
		SD	0.6	1.6	1.5
Cabbage	<50	Mean	0.9	2.4	2.3
		SD	0.6	1.7	1.7
	50-75	Mean	0.7	1.8	1.7
		SD	0.5	1.7	1.3
	76-100	Mean	0.6	1.7	1.6
		SD	0.4	1.5	1.2
	100+	Mean	0.5	1.2	1.4
		SD	0.7	1.5	1.7
			(F = 2.6; n.s.)	(F = 2.8; p<.05)	(F = 1.8; n.s.)
	Total	Mean	4.5	2.7	13.8
		SD	5.6	3.0	14.3
Breadfruit	<50	Mean	9.9	5.1	27.3
		SD	8.2	3.8	19.1
	50-75	Mean	5.8	3.3	16.5
		SD	6.2	3.4	14.5
	76-100	Mean	2.6	1.3	8.4
		SD	2.4	1.6	5.9
	100+	Mean	2.0	1.6	8.5
		SD	1.2	1.7	10.1
			(F = 13.3; p<.01)	(F = 8.9; (p<.01)	(F = 11.6; p<.01)

Food Item	% RDA Satisfaction (Energy)		Mean Proportion (%) of Nutrients Supplied		
			Energy	Protein	Iron
	Total	Mean	11.1	28.7	13.7
		SD	5.2	12.1	7.3
Chicken, Dressed	<50	Mean	26.9	66.5	37.4
		SD	0.0	0.0	0.0
	50-75	Mean	14.0	33.8	16.1
		SD	7.0	16.0	10.8
	76-100	Mean	12.7	31.0	15.3
		SD	6.0	13.5	7.1
	100+	Mean	9.4	25.7	11.9
		SD	4.0	10.1	5.2
			(F = 8.4; p<.01)	(F = 6.0; p<.01)	(F = 6.8; p<.0)

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