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## Factors Influencing Food Habits in Antigua, W.I.

Jill E. Armstrong  
*University of Rhode Island*

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FACTORS INFLUENCING FOOD HABITS

IN ANTIGUA, W. I.

BY

JILL E. ARMSTRONG

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

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## ABSTRACT

A cross-cultural food habit model constructed after review of available literature was used as a guide for investigating food habit determinants. A food habit survey was conducted in Antigua, W. I. in December, 1981 and January, 1982 to test the model. Data collected by questionnaire from 305 households included household food purchase and production, food consumption via 24-hour recall and food frequency, food-related beliefs and socioeconomic characteristics of respondents and household members. Results showed that the Antiguan diet is starch-based and that, despite crop production by about two-thirds of the households sampled, many diets appeared to be deficient in selected fruit and vegetable groups. Diets appeared to be adequate in protein, with reliance on fish, egg, chicken and pork. On a product by product basis, diets appeared to be a mixture of locally-produced items or traditional foods, such as saltfish and local vegetables, and of imported items such as Ovaltine, canned milk, canned fish and Cream of Wheat. Noon and evening meal patterns resembled traditional breakfast (noon) patterns of English-speaking South Caribbean islanders (Jerome, 1975). Investigation into one striking food pattern, the widespread consumption of a

fortified food beverage powder, revealed that the powders supplemented most of the diets with one or more of the selected food groups found to be limiting in respondents' diets and that respondents from a variety of socioeconomic groups were consuming the powders. Analysis of cultural factors influencing food habits revealed that the major food avoidance was pork, for religious reasons. When respondents were asked which foods they would select with extra food money and why, major reasons for choices were related to health and preference. An extensive array of socioeconomic variables representing factors in the model hypothesized to influence food habits in Antigua were tested for a significant correlation (Kendall's tau b coefficient) with a Dietary Adequacy Score reflecting the presence of six selected food groups in a respondent's one-day intake. As a result of multicollinearity among the independent variables significantly ( $p < 0.05$ ) related to the Dietary Adequacy Score, factor analysis of the independent variables was run. Two of the four resulting factors, representing household wealth and the exposure to new ideas, were significantly related to the Dietary Adequacy Score in a multiple linear regression model.

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Food-related Health Concepts of Antiguans  
and Their Application in the Diet

Any study of the food habits of a group of people is not complete without information concerning food-related health concepts and their effects on the diet. It may be of interest, for example, to identify the various health-related messages that a group receives from different sources, the selective retention of those messages and in what ways, if any, the group applies the messages to the food selection process. This kind of information is essential to health educators and other change agents who attempt to improve the dietary adequacy of individuals or groups through nutrition education, advertisement or other means.

Among Antiguans, there is a high level of interest in food and cooking, as well as awareness of some food-related health concepts which can be traced to a variety of sources. This paper presents a discussion of those concepts, their sources and an example of how one commercial nutrition message appears to have influenced the Antiguan diet.

METHODOLOGY

A food habit survey was conducted in the parishes of St. John's and St. Mary's during December, 1981 and early



January, 1982. St. John's Parish, which consists of the capital city of St. John's, its port, oil refinery and other major business centers, is an urban area frequented by tourists. By contrast, St. Mary's Parish, a rural area of fishermen, farmers and others who live in villages, is characterized by a more traditional or agricultural lifestyle.

A lengthy questionnaire was administered to "the lady of the house" or to an alternative adult present in 305 randomly selected households, 150 from St. Mary's and 155 from St. John's. This sample was equivalent to approximately 2% of the households in St. John's and 8% of the households in the villages of St. Mary's (CFNI, 1981). Information collected included the frequency of consumption of selected foods, household production of food, household composition, food preferences and avoidances and opinions about food-related ideas or concepts. Data on food preferences and avoidances were collected by asking each respondent, "What would you buy if you had extra money for food only, and why" and "What foods, if any, do you or your family members avoid and why." Also included with the questionnaire was a 24-hour recall. The recall format required the respondent to name each food or dish consumed over the previous 24 hour period, its ingredients and the

method of preparation of each individual item.

From the 24-hour recall data, a measure of dietary adequacy was derived. Due to the initial emphasis on qualitative rather than quantitative recall data, a Dietary Adequacy (DA) Score was defined as the number of selected food groups in an individual's one-day intake, calculated as follows. The number of different dishes or foods listed by all respondents was counted. Foods and dishes were listed as given by the respondent: for example, "fish and rice" was considered as one dish, whereas "fish" and "rice" listed separately constituted two separate dishes. These foods were then placed under one or more of the following six food categories according to the nutrient composition of each food (CFNI, 1974): Protein foods, Dairy foods, Starches, Vitamin A-containing foods, Vitamin C-containing foods and Other fruits and vegetables (Table 1). The category Other fruits and vegetables (Other) was presumed to represent a variety of vitamins and minerals necessary for a balanced diet. The Dietary Adequacy Score for each individual was then computed as the number of different food groups present in his or her diet, with a maximum of 6.

The effect of fortified food beverages, either Ovaltine, Milo or Complan, on the Dietary Adequacy (DA) Score was examined. According to the label, if prepared

with milk as directed, 0.75 ounces of Ovaltine contributed 45% of the USRDA for vitamins A and C. Since Ovaltine contained the lowest amounts of these vitamins of all three of the commercial preparations on a per pound basis (CFNI, 1974), Milo and Complan were also considered as good vitamin A and C sources if used in comparable quantities. About 90% of the Ovaltine and Milo users were adding milk to their beverage, and Complan is a milk-based preparation. Thus, all three beverages were considered to be Dairy sources as well. In order to examine the effect of the consumption of these beverages on DA Scores, the DA Scores for those individuals using the products were calculated with and without the addition of these foods to categories Vitamin A-containing foods, Vitamin C-containing foods and Dairy foods.

## RESULTS AND DISCUSSION

1. Health-related food concepts from food preference data

Table 2 presents those foods from the food preference data which were associated with health-related food concepts. The majority of foods in Table 2 were frequently consumed items according to food frequency and 24-hour recall data. Thus, foods listed as desirable extra

purchases for nutrition reasons were those present in many diets and not unusual items in that sense. Most items were either animal proteins or vegetables and fruits.

About 52% of the total number of foods listed as desirable extra purchases were associated with the health-related food concepts shown in Table 2. This, in addition to the specificity of some of the concepts, indicates that nutrition-related messages about food were being received and retained.

The concepts in Table 2 may be classified using an adaptation of a scheme suggested by Beaudry-Darisme et al (1972) in a study of food habits in St. Vincent. In that study, respondents' reasons for labeling certain foods as good or bad during infancy, pregnancy and lactation were placed into four categories: "traditional" (eg, unspecific reasons such as "is good for"), "example of others," "influence of a nurse or doctor" and "nutritional reason," which included a nutrition term whether correct or incorrect. "Traditional" reasons listed in Table 1 might be "for body strength and health," "builds the body," "very substantial," "good for the body" and "good for the blood." A number of respondents indicated that they were guided by a doctor's advice. The reasons which included a nutrition term or concept were "nutritious," "contains lots of

vitamins," "rich in protein," "protects the body from starch," "for iron," "to give energy," "for a balanced diet" and "good for sight." The phrase "protects the body from starch" refers to a non-starchy or low-starch food which is an alternative to more starchy meal items and is deliberately eaten in place of starch (Parker, 1982).

"Nutritious" was the term used most frequently as a reason for choosing a food. The protein sources, milk, fish, beef, "meat," poultry and eggs, were also generally associated with "rich in protein," "contains lots of vitamins," "good for the body" and "for body strength and health." Milk, cheese, fresh fish and poultry were foods characterized as "substantial." The concept "protects the body from starch" was exclusively associated in this data with carrot or cabbage and other non-starchy vegetables. Also associated with these foods were the concepts "for balanced diet" and "doctor's advice/health reasons." This implies that increased consumption of non-starchy or low-starch vegetables was being encouraged for what was perceived as nutrition-related reasons. There are health clinics in St. John's and in 3 of the 7 villages surveyed, providing the opportunity for doctors, nurses and other health aides to spread health concepts and influence diets.

The food preference data showed both sophisticated and

erroneous nutrition information. For example, carrots were correctly perceived by two respondents as "good for sight." However, carrots and bananas were perceived to be iron sources by 8 and 5 respondents, respectively. In addition, lettuce and "vegetables" (unspecified) were identified as protein sources by two respondents.

## 2. Health-related food concepts from food avoidance data

Table 3 presents the food-related health concepts associated with foods the respondent and/or respondent's family members avoided. Forty-seven percent of the respondents reported the avoidance of one or more foods; however, health-related reasons accounted for only 9% of the total foods listed. Of the reasons listed in Table 3, "burns the stomach," "other allergy or medical problem" and "health reasons" appear to represent a few random ideosyncrasies. However, the use of the term "unclean" is widespread and health-related in that the term denotes local animals that wander anywhere, eat anything and are therefore "filthy" and unfit for consumption (Parker, 1982). It has not been unusual for pigs, goats and to a lesser extent cattle to roam the villages and streets of St. John's in search of grazing land or other sources of food despite laws and regulations prohibiting such freedom (Livingston, 1981).

The term "unclean" is not generally used to describe imported meat since it is assumed that the quality of imported meat has been more carefully controlled (Bird, 1984). Three respondents linked "unclean" with "religious" reasons for avoiding pork, a possible reference to either the Rastafarian dietary influence (Taylor, 1981) or the practice of Seventh Day Adventists on the island (Parker, 1982). The Rastafarians are vocal about food beliefs and attempt to influence the diets of others (Bird, 1984). Religious reasons for avoiding foods were prominent in the food avoidance data, and it appears that the concepts of religious avoidance and avoidance for sanitary reasons have become linked to some extent. The inclusion of "meat" and chicken in this list of "unclean" animals (3 respondents) may reflect religious influence and/or the general perception of the local conditions under which animals may be raised.

Several seafood products, specifically shad, fresh fish and shark, as well as "tin" or canned foods, were associated with food poisoning. At the time of the survey, fish were typically held un-iced at the market place. Often the only fish placed on ice are those left unsold at the end of the day (Wessel-Daae, 1979). Thus, lower quality (eg, partially spoiled) fish were probably marketed to some extent. In

addition, ciguatera toxin and copper in some local fishing areas have presented health problems (DeJose, 1981). "Tin" or canned foods refers exclusively to import items, since Antigua's single food processing company, Dunlab, was producing only bottled products such as catsup, hot sauce and preserves.

In summary, food avoidance data revealed few food-related health concepts aside from a perception of certain animal foods as "unclean." By contrast, food preference data revealed many more health concepts that Antiguans relate to food. Emphasis was placed on non-starchy vegetables, probably due in part to the influence of health authorities. Carrot or cabbage and other nonstarchy vegetables were the only foods associated with protecting the body from starch, an idea that may be an interpretation of a message from authorities to avoid an excessively starchy diet.

### 3. Overall dietary adequacy of the Antiguan diet

Dietary Adequacy (DA) Scores and the percentage of respondents per score with a food category present are shown in Table 4. A score of 6 indicates an adequately varied diet with respect to the food groups selected for examination. Each cell represents the percentage of respondents with the row score that had that particular food



group in their 24-hour intake. Results show that the diets are built on a protein and starch base. The remaining food categories, Vitamin A-containing foods, Vitamin C-containing foods, Dairy foods and Other fruits and vegetables (Other), represent limiting groups. A potential problem with vitamin A has been already identified in Antigua (PAG Secretariat, 1976); the fact that about 20% more diets contained vitamin A sources than Dairy sources, vitamin C sources or Other fruits and vegetables implies that problems with these food groups may also exist. In this study, 85% of the respondents had a source of vitamin A in their diet (Table 5). Table 1, which lists the foods comprising each category, shows that the fortified beverages were sources of Dairy, vitamin A and vitamin C for many respondents.

The scores must be interpreted in the light of several considerations. First, since quantitative measurements were not made, the use of food groups may not reflect true nutrient adequacy. Secondly, the West Indian practice of serving one-pot meals, where the contribution of any one ingredient may be small, and over-boiled vegetables, which reduces water-soluble vitamin content, can affect the nutrient value of some foods. Thirdly, probable quantities of foods were ignored for the sake of consistency of analysis. For example, sweet pepper and tomato paste,

generally used as seasonings, were listed as vitamin C sources. Finally, if the true vitamin A value of carotenoid-containing foods has been over-estimated in many composition tables as proposed (Simpson, 1983), then the identification of vitamin A sources in the Antiguan diet is subject to error. Thus, it is probable that the present data has overestimated dietary adequacy.

#### 4. The effect of the consumption of fortified beverages on the Dietary Adequacy Score

A total of 82 respondents (27%) consumed a fortified food beverage, Ovaltine, Complan or Milo, during the 24-hour recall period. Table 6 shows the frequency of scores and the percentage of respondents per score with a food category present before the supplementation effect was taken into account. As before, diets were protein- and starch-based. In comparison to the rest of the sample (Table 7), supplemented diets were more likely to have Vitamin C sources already present. For the rest of the respondents (n = 223), diets were more likely to have Dairy and Vitamin A sources. Apparently the 82 respondents as a group were somewhat better than the rest of the sample as a group at getting sources of vitamin C other than Ovaltine, Milo or Complan. However, the fortified food beverages were an essential source of all three food groups for the 82

resondent. Seven people with scores of 1 or 2 in Table 6 (8% of the subset) were relying exclusively on a fortified beverage for Dairy, Vitamin A and Vitamin C.

Figure 1 shows the change in distribution of DA Scores with supplementation. Table 8 shows that in 80% of the cases, the beverages improved the DA Score by at least 1 point. Only 16 cases, most of which had scores of 6 originally, did not benefit in the food categories examined from the addition of the beverages.

#### 5. Characteristics of the respondents using fortified beverages

In order to determine whether the respondents taking Ovaltine, Milo or Complan were typical or atypical of the sample as a whole, a selected socioeconomic profile was made of the two groups (Figures 2-4). The range of ages in both groups was similar and people of all ages were using fortified beverages (Figure 2). Age distribution (Figure 2) and level of education attained (Figure 3) for the two groups of respondents appeared very similar. In addition, similar proportions of females from the sample (76.4%) and the subset (81.7%) were using the products. The proportion of household food preparers with nutrition education in the subset group (46.3%) was not notably greater than that of the total sample (41.0%). Also, the occupational ranking of

the household's chief wage earner within each group, an index of relative income, shows very similar proportions of individuals at each level (Figure 4). Thus, the group of respondents who consumed fortified beverages appeared to be typical of the sample as a whole.

At the time of the survey, at least one television commercial advertising Ovaltine was being broadcast. Although access to television cannot be totally measured by ownership, a somewhat greater percentage of respondents taking the beverages owned TV sets (60.0%) compared to the sample as a whole (52.1%). Since the commercial was frequently broadcast during the evening news program, it was interesting to note that more respondents in the subset (66.0%) than in the total sample (56.7%) were watching news on television.

6. Are fortified food beverages economically viable alternatives to food sources of nutrients?

In the case of Antigua, this question is ultimately concerned with food import dependency. MacIntosh (1978) stated that programs stimulating local vegetable production do not significantly reduce overall food import dependency, since most of the food import dollar in Antigua is spent on meat, dairy, cereal and sugar products. However, certain local foods would provide needed nutrients presently

supplied by Ovaltine and related products: for example, sweet potatoes and carrots (vitamin A), eddo tops (vitamins A and C), the green leaves of other tuberous crops such as cassava (vitamin C) and dasheen (vitamin A), cabbages and tomatoes (vitamin C) and fresh cow's milk from individually owned cows. The contribution of more local food production to the stimulation of the local economy and the reduction of food import dependency might be questionable. However, any efforts to reduce Antiguans' food bills are worthwhile. To this end, cost comparisons should be made between locally available products and imported, processed food supplements or fortificants that provide the same nutrients.

TABLE 1: FOODS AND FREQUENCY OF THEIR USE  
IN CATEGORIES USED TO CALCULATE  
DIETARY ADEQUACY SCORE. FREQUENCIES = NUMBER  
OF INDIVIDUALS WHO CONSUMED THE FOOD.

PROTEIN

CHICKEN (93)  
EGG (81)  
SALTFISH (62)  
RICE & BEANS (52)  
FRESH FISH (47)  
PORK (46)  
BEEF (38)  
BREAD & SAUSAGE (26)  
CHICKEN & VEGS (23)  
FISH & VEGETABLES (22)  
BEEF & VEGS (13)  
MUTTON (11)  
BREAD & SARDINE (11)  
PEAS (10)  
CHICKEN & RICE (9)  
CHICKEN VEG SOUP (9)  
PICKLED MACKEREL (8)  
SAUSAGE/BACON (8)  
BREAD, EGG, CUCUMBER (8)  
HAMBURGER (7)  
BREAD & MEAT (7)  
PIG FEET (7)  
TURKEY (4)  
SARDINE (4)  
HAMROLL (4)  
RICE & SALTBEEF (4)  
NUTS (4)  
KENTUCKY FRIED CHICKEN (3)  
CHICKEN FRANKS (3)  
BREAD, SAUS, EGG (3)  
BREAD, EGG, BACON (3)  
FISH VEG SOUP (3)  
SALTBEEF (2)  
CANNED BEEF (2)  
PORK & BEANS (2)  
BEEF PIE (2)  
BREAD, EGG, CUCUMBER,  
HAM, LETTUCE, TOMATO (2)

BREAD, BEEF, TOMATO (2)  
BREAD, MACKEREL (2)  
RICE & PORK (2)  
MACARONI & BEEF (2)  
BEANS (2)  
STEAK (1)  
SALTFISH & VEGS (1)  
BREAD, SAUSAGE  
CHEESE, CUCUMBER (1)  
CATTLE FEET (1)  
PIZZA (1)  
RICE, OCTOPUS,  
MUTTON, VEGS (1)  
RICE, CHICKEN, PORK (1)  
CLUB SANDWICH (1)  
FISH DUMPLING SOUP (1)  
CASHEWS (1)  
RICE, CHICKEN, FISH (1)

STARCHES

RICE, BEANS (52)  
RICE (51)  
BREAD (38)  
BREAD, CHEESE, BUTTER (36)  
FUNGEE (34)  
BREAD, BUTTER (32)  
MACARONI (32)  
BREAD, CHEESE (31)  
RICE, VEGETABLES (28)  
BREAD, SAUSAGE (26)  
DUMPLING (26)  
SWEET POTATO (20)  
PLAIN TAIN (17)  
CREAM OF WHEAT (16)  
WHITE POTATOES (14)  
BISCUITS (14)  
MACARONI & CHEESE (12)

TABLE 1: CONTINUED

STARCHES, CONT'D

BREAD, SARDINE (11)  
 POTATO SALAD (11)  
 RICE, CHICKEN (9)  
 MASHED POTATOES (8)  
 POTATO CHIPS (8)  
 BREAD, EGG, CUCUMBER (8)  
 BUN (7)  
 CASSAVA, BUGAMENT (7)  
 YAM (7)  
 CORN FLOUR CEREAL (7)  
 BREAD, MEAT (7)  
 OATS (7)  
 TOAST (6)  
 CEREAL (6)  
 CORNFLAKES (5)  
 PUMPKIN (5)  
 PANCAKE, FRITTER (5)  
 CRACKERS  
 RICE, SALTBEEF (4)  
 HAMROLL (4)  
 BREAD, SAUS, EGG (3)  
 BREAD, EGG, BACON (3)  
 BEEF PIE (2)  
 BREAD, EGG, HAM, LETTUCE,  
 TOMATO & CUCUMBER (2)  
 BREAD, MACKEREL (2)  
 RICE, PORK (2)  
 MACARONI, BEEF (2)  
 DASHEEN (2)  
 BREADFRUIT (2)  
 FRENCH FRIES (2)  
 SPAGHETTI (1)  
 FISH DUMPLING SOUP (1)  
 CLUB SANDWICH (1)  
 ARROWROOT DRINK (1)  
 BREAD, SAUS, CHEESE,  
 CUCUMBER (1)  
 PIZZA (1)  
 RICE, MUTTON, OCTOPUS,  
 VEGS (1)  
 RICE, CHICKEN, FISH (1)  
 RICE, CHICKEN, PORK (1)

DAIRY FOODS

MILK (57)  
 OVALTINE (50)  
 CHOCOLATE MILK (44)  
 BREAD, CHEESE, BUTTER (36)  
 MILO (32)  
 BREAD, CHEESE (31)  
 MACARONI, CHEESE (12)  
 ICE CREAM (6)  
 BREAD, SAUSAGE,  
 CHEESE, CUCUMBER (1)  
 PIZZA (1)  
 COMPLAN (1)  
 COCOA (1)

VITAMIN A-CONTAINING  
FOODS

EGG (81)  
 MILK (57)  
 OVALTINE (50)  
 CHOCOLATE MILK (44)  
 BREAD, CHEESE, BUTTER (36)  
 MILO (32)  
 BREAD, CHEESE (31)  
 SWEET POTATO (20)  
 CARROT (18)  
 MACARONI, CHEESE (12)  
 PAPA YA (12)  
 MIXED VEGS (9) \*  
 BREAD, EGG, CUCUMBER (8)  
 GREEN PEAS, CARROTS (7)  
 VEG SALAD (6) \*  
 EDDO TOPS, SPINACH (6)  
 PEPPERPOT (4) \*\*  
 BREAD, SAUS, EGG (3)  
 BREAD, EGG, BACON (3)  
 PAPA YA SALAD (2)  
 BREAD, EGG, HAM, CUC,  
 LETTUCE, TOMATO (2)  
 PIZZA (1)  
 COMPLAN (1)

TABLE 1: CONTINUED

VITAMIN C-CONTAINING  
FOODS

OVALTINE (50)  
 ORANGE JUICE (41)  
 MILK (32)  
 CABBAGE (26)  
 BANANA (26)  
 TOMATO (22)  
 PAPAYA (12)  
 "VEGETABLES" (10) \*\*\*  
 EDDO TOP, SPINACH (6)  
 ORANGE (5)  
 PEPPER POT (4) \*\*  
 PINEAPPLE JUICE (3)  
 SOURSOP DRINK (2)  
 BREAD, BEEF, TOMATO (2)  
 BREAD, EGG, HAM, TOMATO,  
 LETTUCE & CUCUMBER (2)  
 PAPAYA SALAD (2)  
 TANGERINE (2)  
 COMPLAN (1)  
 TOMATO PASTE OR  
 SWEET PEPPER (42) ++

LETTUCE (4)  
 APPLES (3)  
 GRAPE JUICE (3)  
 SALAD (2)  
 GREEN BEANS (2)  
 DUMES (2)  
 SOURSOP DRINK (2)  
 BREAD, EGG, HAM, TOMATO,  
 LETTUCE & CUCUMBER (2)  
 PASSION FRUIT DRINK (2)  
 BREAD, SAUSAGE, CHEESE,  
 & CUCUMBER (1)  
 WATERMELON JUICE (1)  
 GRAPES (1)  
 ONION SOUP (1)  
 VEGETABLE SAUCE (1)  
 SQUASH (1)

\* Contains carrots  
 \*\* Contains stewed dark  
 green leafy vegetables  
 \*\*\* Contains tomato  
 + Contains okra  
 ++ Used as seasonings

OTHER VEGETABLES  
& FRUITS

"JUICE" (MIXED FRUIT DRINKS) (78)  
 FUNGEE (34) +  
 EGGPLANT/OKRA (21)  
 VEGETABLE SOUP (18)  
 CUCUMBER (18)  
 LEMONADE (16)  
 LIMEADE (12)  
 "VEGETABLES" (10)  
 SORREL DRINK (9)  
 MIXED VEGETABLES (9)  
 BREAD, EGG, CUCUMBER (8)  
 VEGETABLE SALAD (6)  
 BEET (4)



TABLE 2: HEALTH-RELATED REASONS FOR PREFERING  
CERTAIN FOODS AS EXTRA PURCHASES

<u>REASON</u>	<u># RESPONSES</u>			
	<u>CABBAGE</u>	<u>CARROT</u>	<u>STARCHY R CROPS (1)</u>	<u>OTHER VEGS (2)</u>
1-NUTRITIOUS	29	30	10	88
2-CONTAINS LOTS OF VITAMINS	3	2	-	5
3-RICH IN PROTEIN	-	-	-	3a
4-PROTECTS THE BODY FROM STARCH	1	3	-	4
5-FOR IRON	-	8	-	-
6-TO GIVE ENERGY	-	-	-	-
7-FOR A BALANCED DIET	-	-	1	2
8-GOOD FOR THE SIGHT	-	2	-	-
9-DOCTOR'S ADVICE /HEALTH REASONS	6	6	1	18
10-FOR BODY STRENGTH & HEALTH	8	9	4	20
11-BUILDS THE BODY	-	-	-	2
12-VERY SUBSTANTIAL	-	-	-	-
13-GOOD FOR THE BODY	13	10	-	19
14-GOOD FOR THE BLOOD	-	-	-	2

- (1) Sweet potato, plaintain, yam, white potatoes,  
bugament, cassava, "ground provisions"  
(2) Tomato, "vegetables," lettuce, spinach,  
cucumber, beets, eggplant, pumpkin, eddo tops,  
peas, squash, onion, string beans, canned  
corn & canned green peas, "green vegetables,"  
cauliflower, okra  
a - "vegetables," lettuce, peas (red bean)

TABLE 2: CONTINUED

<u>REASONS</u>	<u>MILK</u>	<u># RESPONSES</u>		<u>POULTRY</u>
		<u>FRESH FISH</u>	<u>BEEF OR MEAT</u>	
1-NUTRITIOUS	5	19	28	15
2-CONTAINS LOTS OF VITAMINS	4	3	1	4
3-RICH IN PROTEIN	15	5	5	2
4-PROTECTS THE BODY FROM STARCH	-	-	-	-
5-FOR IRON	-	-	-	-
6-TO GIVE ENERGY	3	-	-	-
7-FOR A BALANCED DIET	-	-	-	-
8-GOOD FOR THE SIGHT	-	-	-	-
9-DOCTOR'S ADVICE /HEALTH REASONS	-	1	2	1
10-FOR BODY STRENGTH & HEALTH	7	6	1	2
11-BUILDS THE BODY	9	1	-	-
12-VERY SUBSTANTIAL	3	3	-	1
13-GOOD FOR THE BODY	3	7	7	5
14-GOOD FOR THE BLOOD	-	-	-	-

TABLE 2: CONTINUED

<u>REASON</u>	<u># RESPONSES</u>				
	<u>EGG</u>	<u>CHEESE</u>	<u>FRUIT*</u>	<u>STARCH+OVALTINE</u>	
1-NUTRITIOUS	6	10	-	5	-
2-CONTAINS LOTS OF VITAMINS	-	15	-	-	-
3-RICH IN PROTEIN	3	-	-	-	4
4-PROTECTS THE BODY FROM STARCH	-	-	-	-	-
5-FOR IRON	-	5a	3	-	-
6-TO GIVE ENERGY	-	-	-	1	-
7-FOR A BALANCED DIET	-	-	-	-	-
8-GOOD FOR THE SIGHT	-	-	-	-	-
9-DOCTOR'S ADVICE /HEALTH REASONS	-	1	-	1b	-
10-FOR BODY STRENGTH & HEALTH	-	4	-	-	-
11-BUILDS THE BODY	-	-	1	-	-
12-VERY SUBSTANTIAL	-	-	-	-	2
13-GOOD FOR THE BODY	4	5	-	-	2
14-GOOD FOR THE BLOOD	-	-	-	-	-

\* bananas, "fresh fruits," citrus fruit & juices,  
"fruit juice," aples, grapes, pears, papaya, coconut  
+ flour, macaroni, bread, rice  
a - bananas  
b - rice

TABLE 3: HEALTH-RELATED REASONS  
FOR AVOIDING FOODS

REASON FOR AVOIDANCE	FOOD AVOIDED (FREQ. OF RESPONDENTS)					
	<u>PORK</u>	<u>BEEF</u>	<u>"MEAT"</u>	<u>CHICKEN</u>	<u>MUTTON</u>	<u>EGG</u>
1-UNCLEAN	20	-	1	2	-	-
2-BURNS STOMACH	-	-	-	-	-	-
3-ALLERGY OR OTHER MEDICAL PROBLEM	2	-	-	-	-	1
4-BECAUSE OF FOOD POISONING	-	-	-	-	-	-
5-HEALTH REASONS	1	2	-	1	1	-

REASON FOR AVOIDANCE	FOOD AVOIDED (FREQ. OF RESPONDENTS)				
	<u>MILK</u>	<u>CORN MEAL</u>	<u>LOCAL BEEF</u>	<u>SEAFOOD PRODUCTS</u>	<u>SWEET POTATOES</u>
1-UNCLEAN	-	-	-	-	-
2-BURNS STOMACH	-	-	1	-	3
3-ALLERGY OR OTHER MEDICAL PROBLEM	1	1	1	3a	1
4-BECAUSE OF FOOD POISONING	-	-	-	3b	-
5-HEALTH REASONS	-	1	-	-	-

a - red herring, fried fish, sardine  
b - shad, "fresh fish," shark

TABLE 3: CONTINUED

<u>REASON FOR AVOIDANCE</u>	<u>FOOD AVOIDED (FREQ. OF RESPONDENTS)</u>			
	<u>OTHER VEGETABLES</u>	<u>CHEESE</u>	<u>HIGH CAL FOODS</u>	<u>CANNED FOODS</u>
1-UNCLEAN	-	-	-	-
2-BURNS STOMACH	-	-	-	-
3-ALLERGY OR OTHER MEDICAL PROBLEM	5c	-	3f	-
4-BECAUSE OF FOOD POISONING	-	-	-	1
5-HEALTH REASONS	1d	1	3e	-

c - eddoes, onion, breadfruit, peppers

d - yam

e - dumpling, fatty foods, mayonnaise

f - fatty foods, starch

TABLE 4: FREQUENCY DISTRIBUTION  
OF DIETARY ADEQUACY (DA) SCORES AND PERCENTAGE  
OF RESPONDENTS WITH EACH FOOD CATEGORY  
PER DIETARY ADEQUACY SCORE, N = 305

DA SCORE	% SAMPLE WITH SCORE	FOOD CATEGORY (% RESPONDENTS)					
		P (1)	D (2)	S (3)	A (4)	C (5)	O (6)
0	1	0	0	0	0	0	0
2	4	92	0	100	0	0	8
3	13	85	10	97	36	27	46
4	17	92	43	98	87	41	38
5	34	99	77	100	99	66	59
6	31	100	100	100	100	100	100

(1) Protein foods, (2) Dairy foods, (3) Starches  
(4) Vitamin A-containing foods, (5) Vitamin  
C-containing foods, (6) Other fruits & vegetables

TABLE 5: PERCENTAGE OF RESPONDENTS' DIETS  
WITH EACH FOOD CATEGORY PRESENT, N = 305

<u>FOOD CATEGORY</u>	<u>% DIETS</u>
STARCHES	99
PROTEIN	95
VITAMIN A FOODS	85
DAIRY FOODS	66
OTHER VEGETABLES & FRUITS	64
VITAMIN C FOODS	64

TABLE 6: FREQUENCY DISTRIBUTION OF  
DIETARY ADEQUACY SCORES AND PERCENTAGE  
OF RESPONDENTS WITH EACH FOOD CATEGORY  
PER DIETARY ADEQUACY SCORE BEFORE SUPPLEMENTATION  
WITH A FORTIFIED FOOD BEVERAGE, N = 82

		<u>FOOD CATEGORY (% RESPONDENTS)</u>					
<u>DA</u>	<u>% SAMPLE</u>	<u>P(1)</u>	<u>D(2)</u>	<u>S(3)</u>	<u>A(4)</u>	<u>C(5)</u>	<u>O(6)</u>
<u>SCORE</u>	<u>WITH SCORE</u>						
1	1	0	0	100	0	0	0
2	7	100	0	100	0	0	0
3	13	100	0	100	27	18	54
4	28	91	39	100	74	48	48
5	37	100	33	100	100	80	87
6	14	100	100	100	100	100	100

(1) Protein foods, (2) Dairy foods, (3) Starches,  
(4) Vitamin A-containing foods, (5) Vitamin  
C-containing foods, (6) Other fruits & vegetables

TABLE 7: FOOD CATEGORIES IN DIETS  
OF SUPPLEMENT USERS VERSUS NON-USERS

<u>FOOD CATEGORY</u>	<u>% OF SAMPLE</u>		
	<u>SUPPLEMENT USERS, N=82</u>		<u>NON-USERS N=223</u>
	<u>BEFORE SUPPLEMENT</u>	<u>AFTER SUPPLEMENT</u>	
PROTEIN FOODS	96	96	95
STARCHES	100	100	98
DAIRY FOODS	37	100	54
VITAMIN A -CONTAINING FOODS	74	100	79
VITAMIN C -CONTAINING FOODS	58	100	51
OTHER FRUITS & VEGETABLES	66	66	63



TABLE 8: CHANGE IN RESPONDENTS' DIETS  
BY ADDITION OF SUPPLEMENT, N = 82

<u>CHANGE IN DIETARY ADEQUACY SCORE</u>	<u>PERCENT OF CASES</u>
0	19.5*
1	46.4
2	18.3
3	15.8

\* 11 cases had score = 6, 4 had  
score = 5, 1 had score = 4

FIGURE 1: CHANGE IN DA SCORE  
WITH GEMAW SUPPLEMENTATION

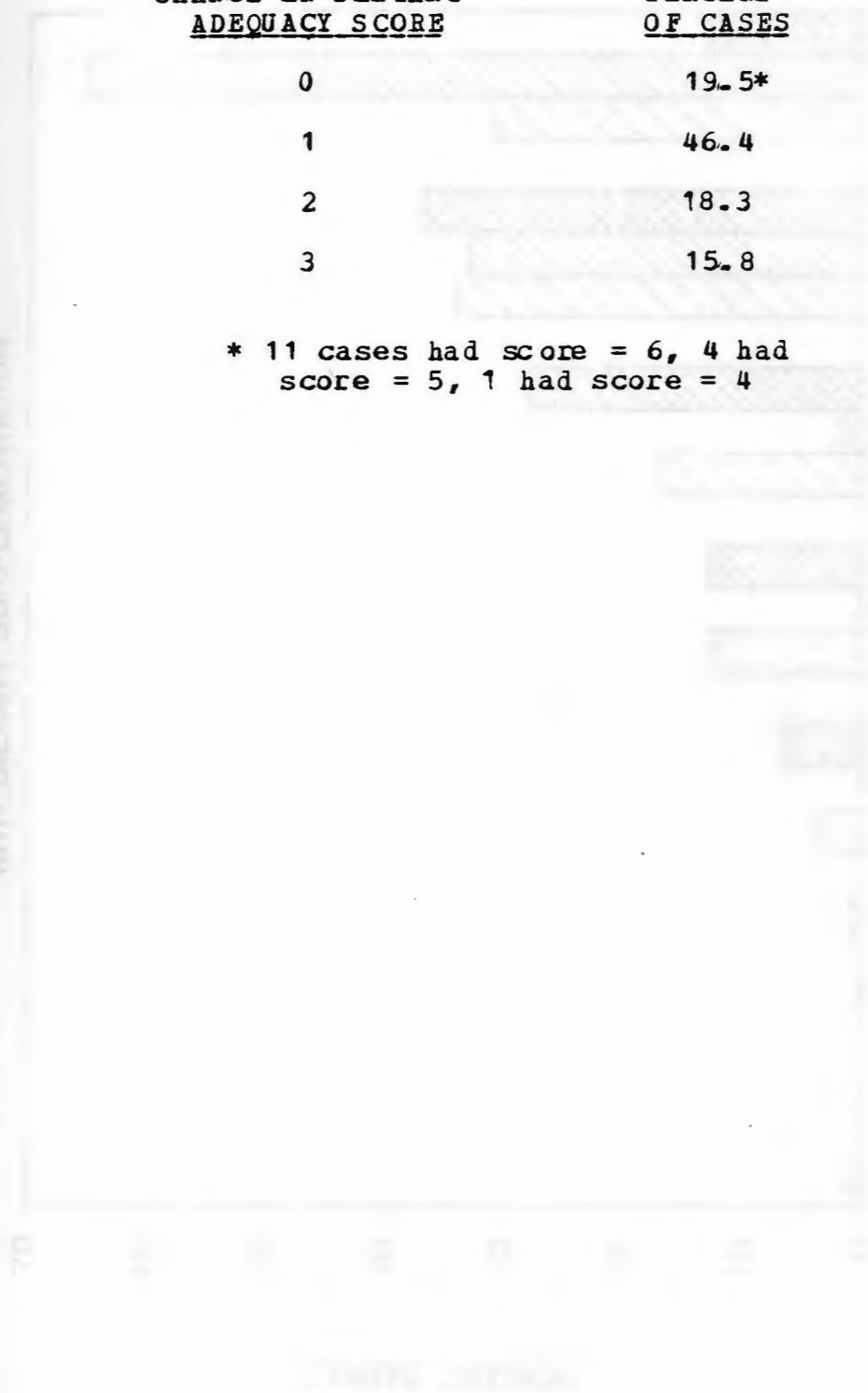


FIGURE 1: CHANGE IN DA SCORE  
WITH DIETARY SUPPLEMENTATION

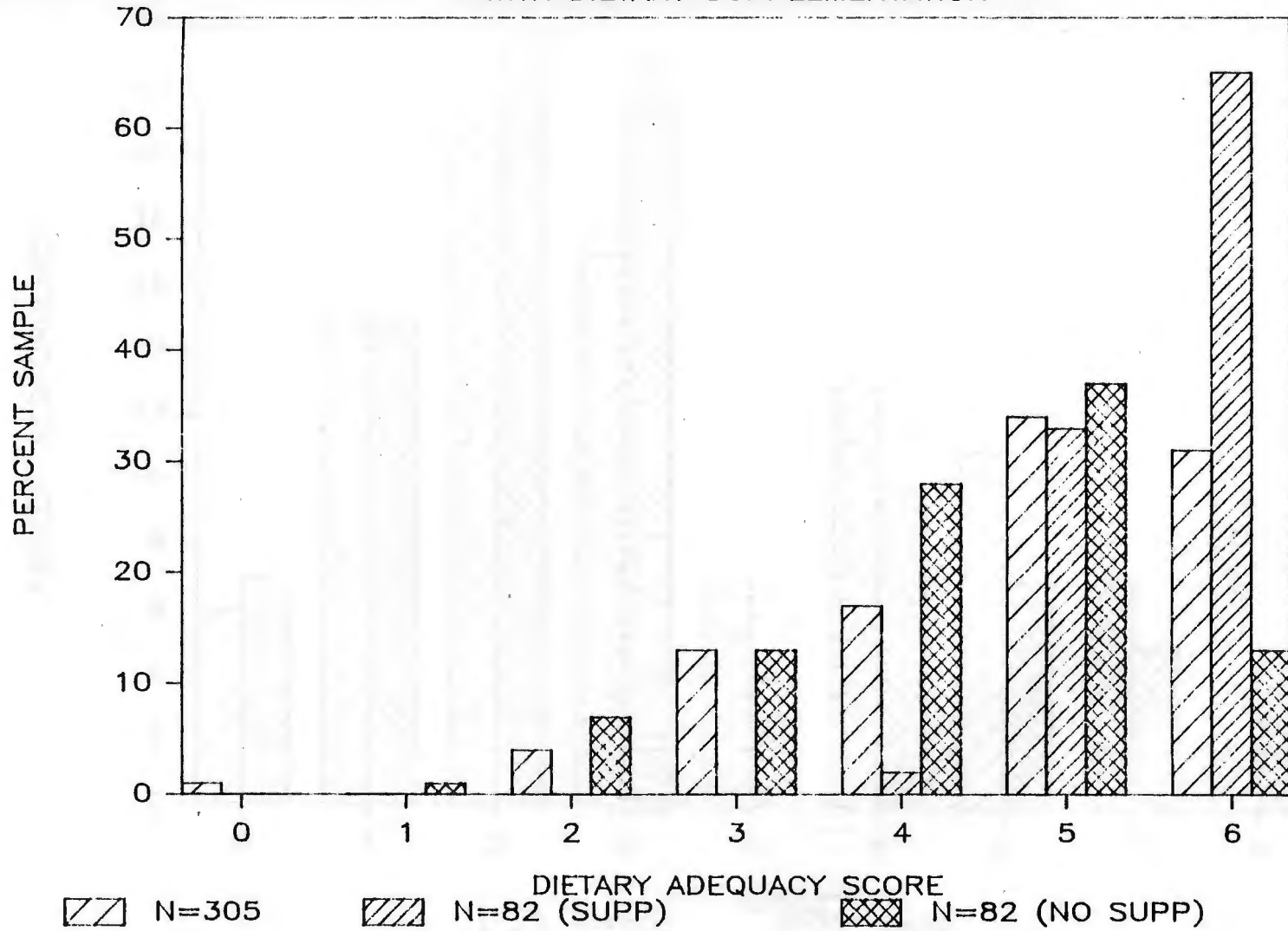
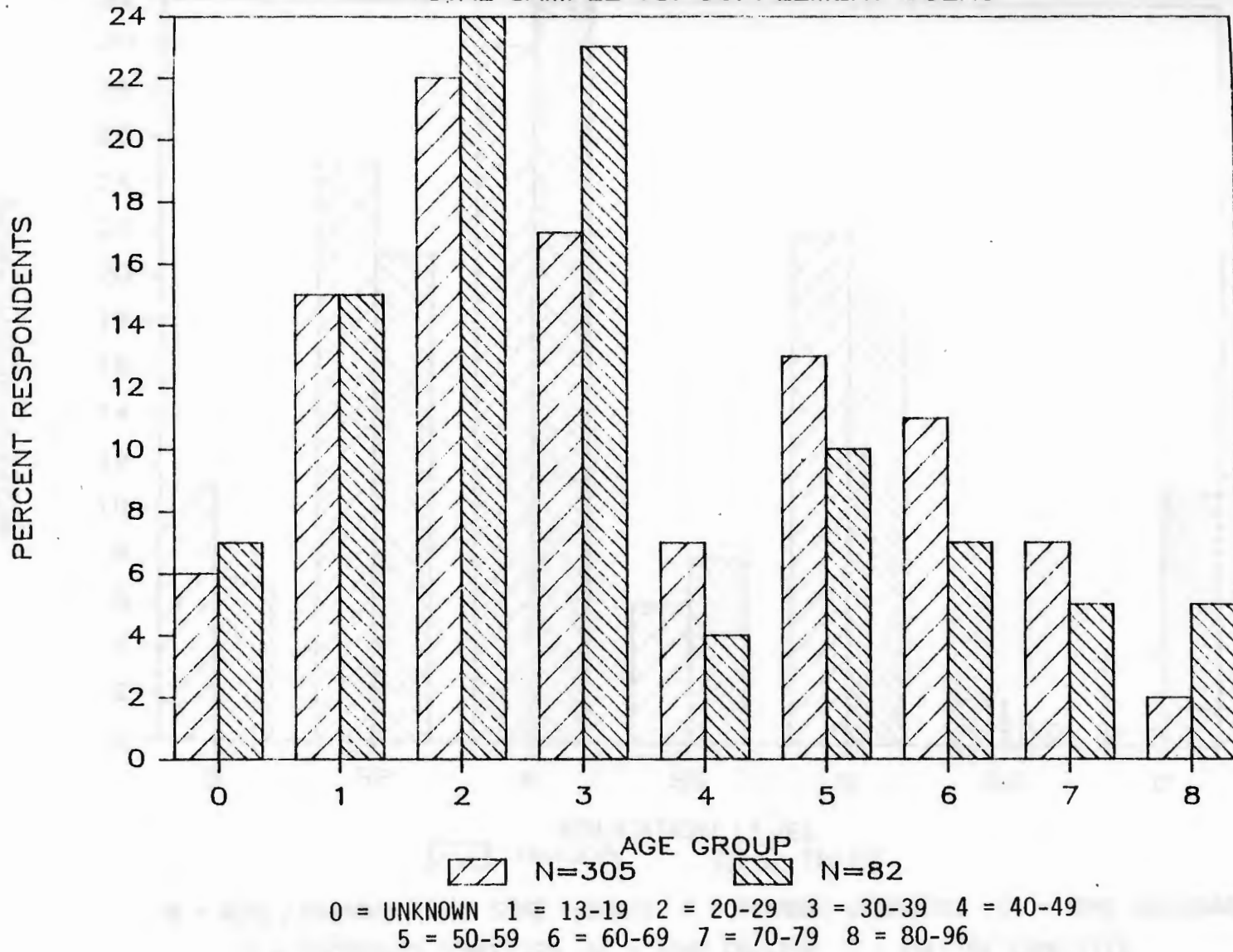


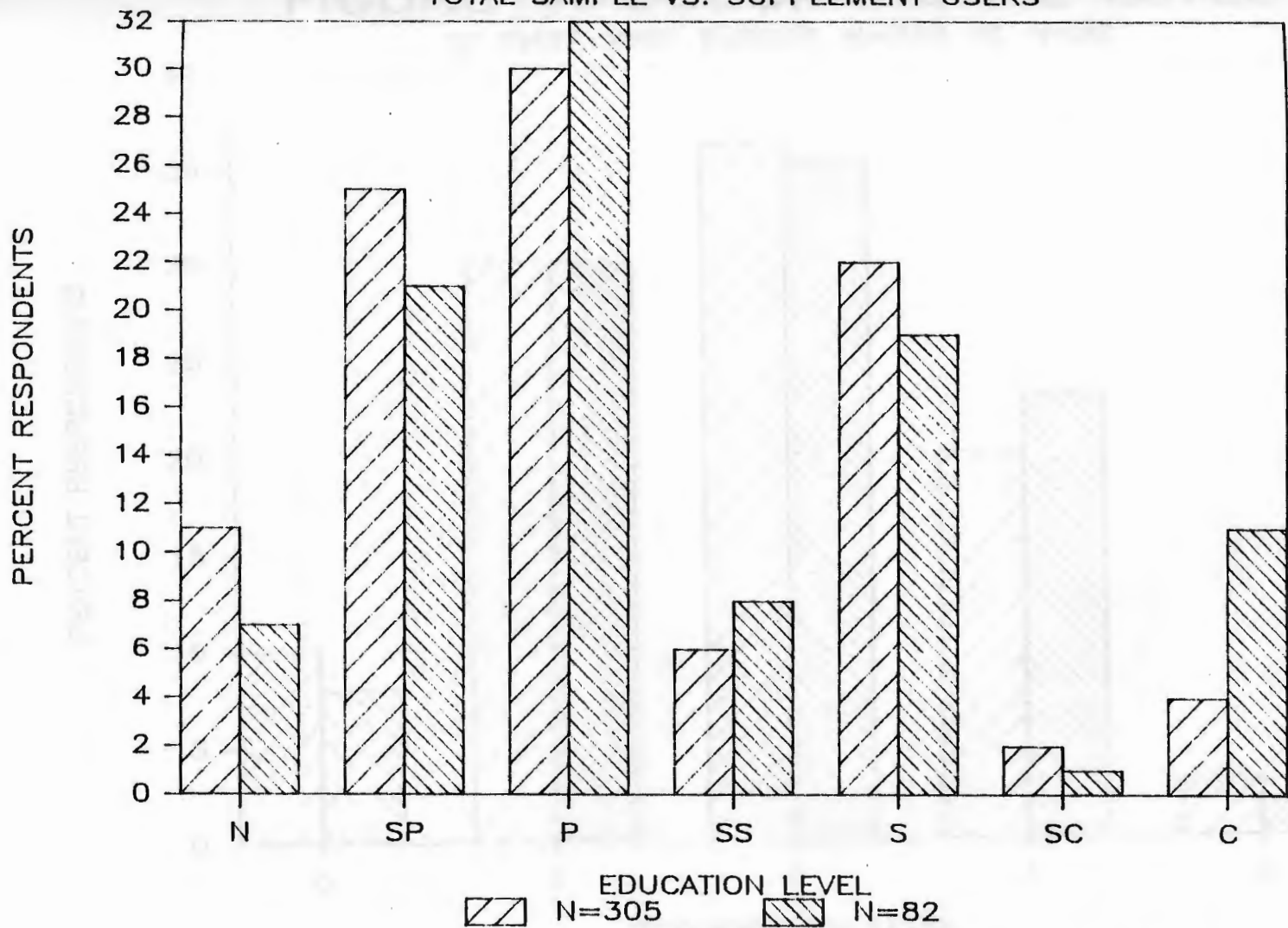
FIGURE 2: AGE RANGES,

TOTAL SAMPLE VS. SUPPLEMENT USERS



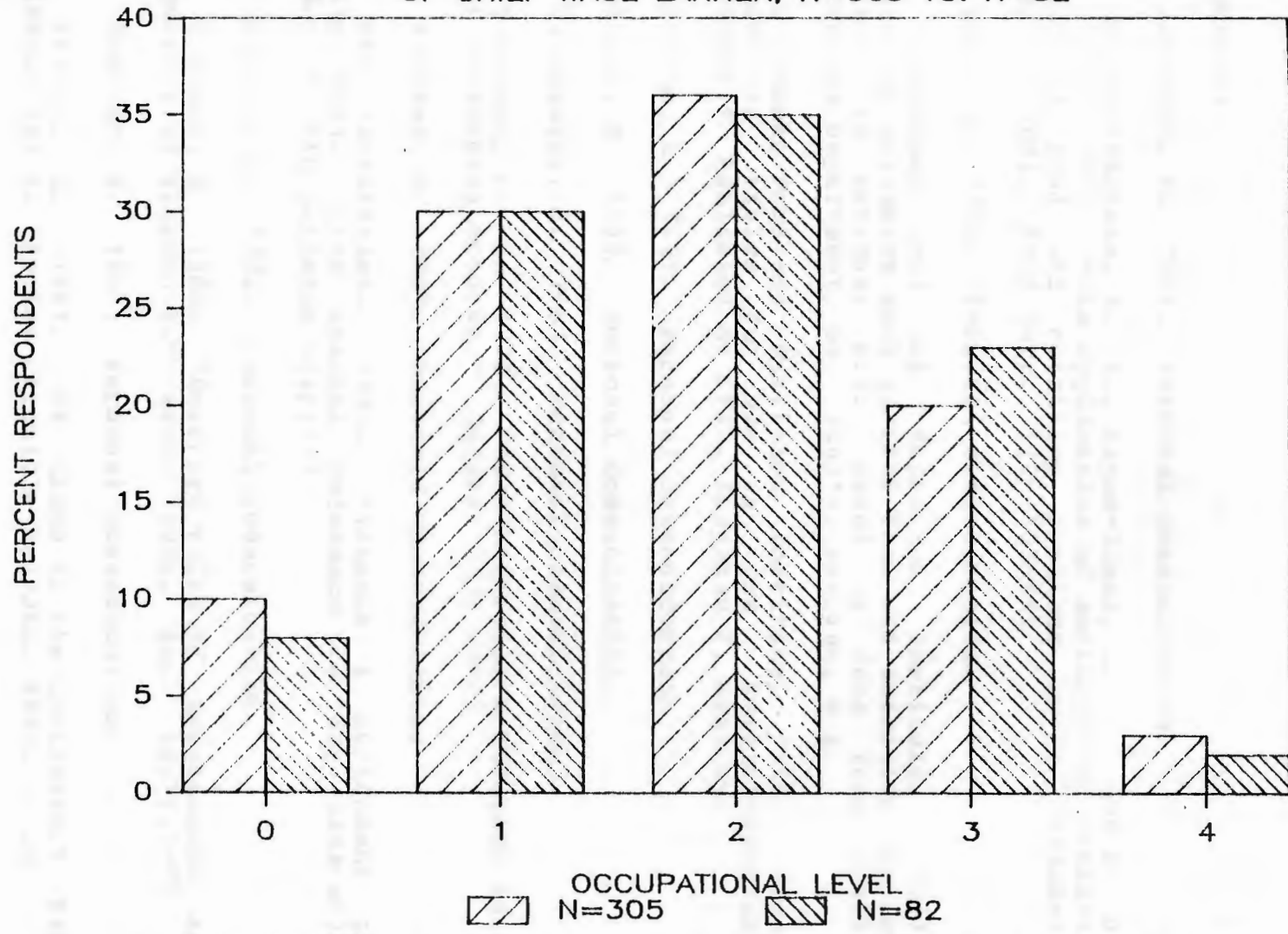
# FIGURE 3: RESPONDENTS' EDUCATION

TOTAL SAMPLE VS. SUPPLEMENT USERS



N = NONE, UNKNOWN    SP = SOME PRIMARY    P = PRIMARY COMPLETED    SS = SOME SECONDARY  
 S = SECONDARY COMPLETED    SC = SOME COLLEGE    C = COLLEGE COMPLETED

FIGURE 4: OCCUPATIONAL LEVEL  
OF CHIEF WAGE EARNER, N=305 VS. N=82



0 = NONE, UNKNOWN 1 = LOW-INCOME 2 = MEDIUM-INCOME 3 = WHITE COLLAR 4 = PROFESSIONAL

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Sociocultural Factors Influencing  
Food Habits in Antigua, W.I.

INTRODUCTION

In the study of food habits, there are often two objectives: to ascertain the dietary adequacy of a group of people and to determine which socio-cultural and ideological factors influence their dietary behavior, giving insight as to how diets may be practically improved. In combining these objectives, many researchers have used dietary data to calculate a variable reflecting dietary quality and then used this measure as the dependent variable in subsequent analyses which relate dietary variation to variation in socio-cultural variables.

Two general approaches have been used to calculate the dietary variable. The first is a quantitative measure of quality using, for example, a Diet Rating based on the %RDA of selected nutrients in the diet (Florencio, 1980). The second approach is to calculate dietary diversity or complexity on the assumption that increasingly complex diets are increasingly nutrient complex and therefore more nutritionally adequate. Dietary diversity based on various food categories has been calculated from 24-hour recalls (Caliendo et al, 1976 and Marchione, 1981). Other researchers have used dietary data to form a Guttman scale



indicating a cumulative, unidimensional pattern of complexity (Chassy et al, 1967; Sanjur et al, 1970 and Beaudry-Darisme et al, 1972). Diversity scores and the Guttman scale can be easily interpreted as measures of dietary quality if the scale items or score categories reflect specific food groups. However, the value of these scores or scales depends on the initial data and the researcher's selection of food groups in the pattern analysis.

Subsequent analyses testing the likelihood of an association between the dependent variable (dietary quality) and a number of independent variables commonly utilize the chi-square statistic, Pearson's  $r$  (correlation coefficient), Kendall's tau  $b$  statistic, or other tests of association. Such analyses can identify independent variables significantly related to the dietary variable. Their collective effect on the dietary (dependent) variable can be tested by applying a multiple linear regression model to the data. McDowell and Hoorweg (1977) looked at socioeconomic variables at the household level hypothesized to predict recovery of a child from malnutrition. Regression was used to identify which variables accounted for most of the variance in recovery, and the total variance explained by the variables examined. Popkin (1981) investigated the

extent to which selected household variables predict preschooler nutritional status in a linear model, emphasizing that both socioeconomic and nutritional data should be collected at the community level for such an analysis.

A series of multiple regression analyses have been used to test the likelihood that certain variables may be intermittent to others in predicting the dependent variable (path analysis). Sims (1978) used regression analyses to test her hypothesis that attitudes among lactating women influence their nutrition knowledge which in turn influences their food behavior in a linear fashion. In a study of preschoolers and their families in New York, Caliendo et al (1976) ran multiple regressions on a set of family and maternal variables plus the child's dietary quality, and determined that two variables were intermittent and dependent; "homemaker attitudes" and the child's "dietary diversity score" directly affected dietary quality, but were also dependent on the mother's nutrition education.

No data has yet been published on the dietary adequacy of Antiguans. The Antiguan food supply is characterized by limited local production and an overall dependence on imports. Some fruits, vegetables and animal products are produced locally. However, MacIntosh (1978) has maintained

that "from a nutritional standpoint, the bulk of the foodstuffs consumed in Antigua is imported" and that the major food spending by Antiguans is on cereal, meat, dairy and sugar products, rather than produce. In the present study, the dietary adequacy of a sample of Antiguan diets was calculated from 24-hour recall data that were primarily qualitative, rather than quantitative in nature. Tests of association and a multiple linear regression analysis were conducted to identify socioeconomic and/or ideological factors associated with variation in a Dietary Adequacy Score as an example of how statistical analyses used by social scientists can be applied to food habit research.

#### RESEARCH DESIGN

Antigua has developed a tourism-based economy while retaining aspects of a traditional agricultural lifestyle in rural areas. It was assumed that two survey groups furnishing a rural farming/fishing versus urban/business center contrast in lifestyle would encompass the full range of food habits in this context. Two parishes, or regional divisions on the island, were chosen for this purpose: St. Mary's, a rural area of fishermen and farmers, and St. John's, consisting of the capital city of St. John's, its port, oil refinery and other major business centers.

#### METHODOLOGY

### Sample

A random sample of 305 households was taken, representing approximately 2% of the households in St. John's (n=155) and 8% of the households in the seven villages in St. Mary's (n=150). Survey divisions in St. John's and household estimates for both parishes were obtained from the Caribbean Food and Nutrition Institute (1981).

The sampling procedure consisted of counting buildings counterclockwise along the perimeter of a survey division inwards up to a random number and then sampling a pre-determined number of houses in a cluster.

### Questionnaire

A questionnaire collecting data on Antiguan food habits and socioeconomic factors hypothesized to be significant in determining food habits in Antigua was drafted at the University of Rhode Island, critiqued and modified by Antiguan professionals in food, agriculture and health and pre-tested in several households in St. John's. The instrument included an adaptation of the modified semantic differential test board (Dewalt and Pelto, 1977) for ranking foods or ideas according to the desired criteria and a 24-hour recall.

### Interview

Seven Antiguan women were recruited and trained to give interviews. Four who were from the city worked exclusively in St. John's and the remaining three who were from various villages in St. Mary's worked exclusively in that parish.

Interviewers were instructed to ask for the "lady of the house" first, or to interview any adult member if no older women were present. Although interviewers worked as teams in counting and selecting houses, they worked individually in administering interviews.

#### Data

##### Dependent variable: Dietary Adequacy (DA) Score

Twenty-four hour recalls were obtained for all 305 respondents, representing the seven days of the week across the sample. Overall, 164 different foods were listed. All 164 foods were then placed under one or more of the following six food categories according to the nutrient composition of each food (CFNI, 1974): Protein foods, Dairy foods, Starches, Vitamin A-containing foods, Vitamin C-containing foods and Other fruits and vegetables (Table 1). For each respondent, the DA Score was computed as the number of different food categories present in an individual's diet, with a maximum score of 6.

Socioeconomic variables More than 20 socioeconomic variables hypothesized to be related to dietary adequacy and

the dependent variable were entered in a correlation matrix for which Kendall's tau b coefficient was calculated for each pair of variables. This statistic measures the degree of association between ordinal variables. Independent variables included household size, composition, food resources, wealth and income, education (general and nutrition) and cosmopolitanness (degree of exposure to new ideas) of the respondent and/or household.

The following socioeconomic variables were selected from the larger set for further analysis based on the magnitude and significance ( $p < .05$ ) of their rank correlation (Kendall's tau b coefficient) with the dependent variable (Table 2).

Household wealth The questionnaire included a list of 20 household items selected to represent the expected variety of major household items to be found in Antiguan homes, including cooking equipment, a refrigerator and certain recreational items. Each item was marked present or absent in each household where an interview took place. Factor analysis was used to reduce this list of items to a smaller number of factors representing clusters of household acquisitions found throughout the data. The first of six factors extracted was called "Basic" and interpreted as the initial level of household wealth above

subsistence. It included the following items: electric iron (0.78), black and white TV (0.74), refrigerator (0.73), gas stove (0.72), radio (0.52), toilet (0.43) and stereo (0.41). Respondents' factor scores on this variable were used in further analyses. The number of rooms in the house (# rooms) and ownership of a car (own car) were also measures of household wealth.

Occupational level of the chief wage earner (occup. level) Each respondent was asked to name the occupation of the household's chief wage earner. The total sample list of 99 different occupations was condensed into four ranked categories - low-income, medium-income, white collar or professional - based on the relative skill or education required and relative estimated income.

Education of the respondent (resp. educ.) Primary education in Antigua consists of 11 years of instruction and is followed by 2 years of secondary schooling. The following categories were used to record the respondent's education: some primary, primary completed, some secondary, secondary completed, some college, college completed.

Nutrition education of the food preparer in the household (nutr. ed.) Respondents were asked if the person responsible for preparing food in the household had any nutrition education or instruction in food. Responses were

recorded as yes or no.

Household food production Respondents were coded according to the presence or absence in their households of members who fished (fishing) or who raised and sold animals (sell animals).

Cosmopolitanness Whether or not the respondent had a friend from overseas was used as one indication of the respondent's exposure to outside ideas (friend).

#### RESULTS

Table 2 presents the rank correlation matrix of the dependent variable, the Dietary Adequacy (DA) Score, and the independent variables. Several observations can be made. First, variables such as level of respondent's education, nutrition education of the food preparer, number of rooms in the house and having a friend from overseas appear to be the best individual predictors of variation in dietary adequacy based on the relative magnitude and significance of their rank correlation coefficients with the DA Score. However, it is apparent that the rank correlation coefficients between several of the independent variables are of greater magnitude and significance than the coefficients between those variables and the DA Score. For example, the coefficient for the rank correlation between Basic and number of rooms was 0.432 ( $p < .01$ ) compared to their



coefficients of 0.128 and 0.135 ( $p < .01$ ), respectively, with the DA Score. Similarly, the occupational level of the chief wage earner and the level of education attained by the respondent had a correlation coefficient of 0.331 ( $p < .01$ ) compared to their coefficients of 0.119 ( $p < .05$ ) and 0.154 ( $p < .01$ ), respectively, with the DA Score. The presence of multicollinearity in this context indicated two things: first, that certain pairs or even clusters of independent variables may be measuring the same or related factors and second, that the effect on a multiple regression would be to inflate the variances of the independent variables and thus distort the results of the regression analysis (Tabachnick and Fidell, 1983).

For these reasons, it was hypothesized that a factor analysis of the independent variables, using orthogonal rotation and the component analysis model for extraction of factors, would extract a smaller set of theoretical constructs with the following properties as independent variables:

1. presentation of the data in a form more representative of the complex, real world, and
2. zero correlations with each other.

Table 3 shows the factors extracted from a factor analysis of the independent variables from Table 2. Factor

1 represents household wealth, largely through material items and house size. Factor 2 represents the education-career relationship in the household - more highly educated respondents tend to live in households where the chief wage earner holds a relatively high job position. Ownership of a car is related to this education-career factor and selling animals is negatively associated with increasing education-career positions. Factor 3 represents a theoretical construct principally related to both the nutrition education of the person in the household who prepares the food and the respondent's friendship with someone from overseas. The negative loading reflects the coding of "friend" as 1 = yes, 2 = no. One plausible interpretation of the dimension underlying these two variables would be that both can result in the exposure to new ideas that affect food intake directly and indirectly. In the sense that these new ideas can influence behavior, they can be thought of as an ideological influence on food choice. Although these variables could have an economic interpretation in that nutrition education about food budgeting may save money and a friend from overseas may provide money or gifts, it is important to note that neither household wealth nor occupational level loaded onto Factor 3. The last factor may simply be called the "fishing"

factor; fishing appears to be an activity that is unrelated to most other variables in this analysis. Occupational level is negatively associated with this factor partly because the occupation of fisherman was categorized as a low-income occupation.

These four factors together account for 66% of the variance among the nine independent variables. Sixty percent or more of the variance explained is considered satisfactory in social-anthropological applications of factor analysis (Hair, Jr. et al, 1979).

#### Multiple Regression Model

Using respondents' factor scores on each of the four factors as the independent variable measures, a multiple linear regression of the Dietary Adequacy Score on the four factors was run. Results are presented in Table 4.

Of the four factors, only two - Factor 1 (household wealth) and Factor 3 (exposure to new ideas) - correlate significantly with the DA Score. While this result does not eliminate all possibility of a relationship between Factors 2, 4 and the DA Score, it eliminates the probability of a linear one. Thus, it would appear that diets increasing in nutrient variety do not necessarily occur with increasing education-career positions and household fishing activity.

As indicated in Table 4, the R-square value after

Factors 1 and 3 were entered was low despite a highly significant F value ( $p = .0001$ ). Thus, a small proportion of the variance in the dependent variable has been appropriately explained by a linear relationship with two theoretical constructs accounting for about 36% of the variance among the nine variables used in the original factor analysis.

As a test of the assumptions in the regression analysis, a scatterplot of the standardized predicted values of the dependent variable against the standardized residuals is displayed in Figure 1. Comparison with Figure 2a indicates that assumptions seem to be met.

## DISCUSSION

### A. Application of Factor Analysis and the Linear Model

A critique of the application of factor analysis and a multiple linear regression model to this data must begin with an examination of the zero order correlations among the variables. It is clear that most of the independent measures selected were predictors of similar magnitude of the dependent variable and that, although the coefficients were somewhat low, they were statistically significant. Secondly, if the multiple linear regression model was to be applied, the multicollinearity in the data would have to be removed. To this end, a factor analysis was run on the

independent variables in an exploratory way, with orthogonal factors as the only major restriction on the analysis.

Although factor analysis can lead to an understanding of dimensions that interrelate or underly variables, it may or may not reveal dimensions that highly correlate with dietary adequacy. The original independent variables are probably the best starting point in attempting to explain the low correlation that resulted between these dimensions or factors and the DA Score. For example, as economic indices, selling animals and occupational level were probably not specific enough measures. Whether a respondent's household sold animal products or not may only have differentiated respondents at a certain socioeconomic level as defined by other variables having an overall greater effect on dietary adequacy. Also, the quantity and type of animal product sold and the use of the subsequent income could not be reflected in this measure. In addition, the occupational level of the chief wage earner alone may not be an accurate reflection of the relative spendable income within the household if there is more than one wage earner.

The low, but statistically significant, R-square obtained from the analysis suggests, in the light of the previous discussion, that the multiple linear regression

model is an appropriate model to apply in this exploratory study and that a logical next step might be to devise measures of greater sensitivity in the areas pointed out by the original independent variables, to add new variables, or both.

#### B. Interpretation of the Linear Model

Of the two factors in the model, the one explaining the most variance in the DA Score is the household wealth factor. This result implies that Antiguan living in households with certain "modern" appliances as well as recreational items, and of overall larger house size, tend to have diets more adequate in selected food groups that were found to be generally limited in the diets. Although wealth is said to be strongly correlated with income and is usually a convenient measure of purchasing power (Popkin, 1981), it does not appear to be strongly linked to occupation level in this study. This may be for several reasons. First, total spendable income (for food as well as other items) may not be adequately measured by only the chief wage earner's position if there are two or more wage earners in the household. Secondly, households owning the "Basic" array of items and having increasingly larger houses may only characterize a subset of all possible income groups represented by the four occupation levels. Thirdly, there

may be a set of factors determining the magnitude, distribution and dispensation of incomes that would furnish the link(s) between occupational level and household wealth. Clearly, however, this factor shows that households with a certain level of assets are enjoying more adequate diets. These assets imply a capacity to purchase foods.

Factor 3, the exposure to new ideas via nutrition education and the respondent's friend from overseas, is the only other factor with a significant linear relationship to dietary adequacy. This seems to indicate that at least two aspects of modernization in Antigua - teaching nutrition education and establishing friendly contact with foreigners - are related to positive dietary effects. A friend from overseas might introduce an Antiguan to new food customs directly. Alternatively, the Antiguan who has a friend from overseas may be the kind of individual who has a relatively better diet. It also appears that continued efforts to improve and expand nutrition education in Antigua would be a good health investment.

These results contribute some perspective to the continuing debate over the predominance of socioeconomic versus ideological factors in the shaping of food habits. These factors involve "economic, political and structural features" versus "the role of cultural beliefs,"

respectively (Dewalt and Pelto, 1977). Prominent among studies of cultural beliefs are reports of the influence of cultural and/or religious taboos on food behavior (James, 1979; Katona-Apte, 1977; Knutsson and Selinus, 1970). In contrast, Dewalt and Pelto (1977) argued that the people in the Mexican community they studied were already aware of the idea of "good nutrition" and simply required the economic means to implement their knowledge. de Chavez (1972) reported that the economic capacity for change limited the effectiveness of dietary instruction in infant diets in three Mexican communities. In Antigua, it appears that exposure to new ideas - expressed as the household food preparer's nutrition education and the respondent's friendship with someone from overseas - as well as material wealth are positively associated with dietary adequacy as defined in this paper. Thus, ideas as well as economic factors play a role in influencing the Antiguan diet.

#### IMPLICATIONS

It is probable that an analysis of the origins of the foods listed in the 24-hour recalls would reveal that the majority were imported, though they may fit traditional food patterns. It is also likely that the reliance on imports will increase in the near future, rather than decrease. Thus, purchase of these foods will be a function of



affordability, whether those foods are new products or traditional ones, as well as exposure to ideas about the foods. Commercial advertising in Antigua is one source of ideas that has apparently influenced local consumption of imported fortified food beverage powders (Armstrong, 1985).

These results also suggest an approach the Antiguan government might make to stimulating food purchasing and production, including some traditional food ways. Specifically, the promotion of ideas as well as economic motivation may be helpful. If the objective is to stimulate food production for local consumption, economic incentives to farm or raise animals coupled with the promotion of national pride in Antigua's unique traditional food ways might bring greater chances for success. Nutrition education programs could teach the nutritional value and creative preparation of traditional foods. Such an effort was demonstrated with an experimental CARICOM (Caribbean Community) nutrition education syllabus that Antiguan primary and secondary teachers were testing at the time of the survey (Hurst, 1981).

TABLE 1: FOODS AND FREQUENCY OF THEIR USE  
IN CATEGORIES USED TO CALCULATE  
DIETARY ADEQUACY SCORE. FREQUENCIES = NUMBER  
OF INDIVIDUALS WHO CONSUMED THE FOOD.

PROTEIN

CHICKEN (93)  
EGG (81)  
SALTFISH (62)  
RICE & BEANS (52)  
FRESH FISH (47)  
PORK (46)  
BEEF (38)  
BREAD & SAUSAGE (26)  
CHICKEN & VEGS (23)  
FISH & VEGETABLES (22)  
BEEF & VEGS (13)  
MUTTON (11)  
BREAD & SARDINE (11)  
PEAS (10)  
CHICKEN & RICE (9)  
CHICKEN VEG SOUP (9)  
PICKLED MACKEREL (8)  
SAUSAGE/BACON (8)  
BREAD, EGG, CUCUMBER (8)  
HAMBURGER (7)  
BREAD & MEAT (7)  
PIG FEET (7)  
TURKEY (4)  
SARDINE (4)  
HAMROLL (4)  
RICE & SALTBEEF (4)  
NUTS (4)  
KENTUCKY FRIED CHICKEN (3)  
CHICKEN FRANKS (3)  
BREAD, SAUS, EGG (3)  
BREAD, EGG, BACON (3)  
FISH VEG SOUP (3)  
SALTBEEF (2)  
CANNED BEEF (2)  
PORK & BEANS (2)  
BEEF PIE (2)  
BREAD, EGG, CUCUMBER,  
HAM, LETTUCE, TOMATO (2)

BREAD, BEEF, TOMATO (2)  
BREAD, MACKEREL (2)  
RICE & PORK (2)  
MACARONI & BEEF (2)  
BEANS (2)  
STEAK (1)  
SALTFISH & VEGS (1)  
BREAD, SAUSAGE  
CHEESE, CUCUMBER (1)  
CATTLE FEET (1)  
PIZZA (1)  
RICE, OCTOPUS,  
MUTTON, VEGS (1)  
RICE, CHICKEN, PORK (1)  
CLUB SANDWICH (1)  
FISH DUMPLING SOUP (1)  
CASHEWS (1)  
RICE, CHICKEN, FISH (1)

STARCHES

RICE, BEANS (52)  
RICE (51)  
BREAD (38)  
BREAD, CHEESE, BUTTER (36)  
FUNGEE (34)  
BREAD, BUTTER (32)  
MACARONI (32)  
BREAD, CHEESE (31)  
RICE, VEGETABLES (28)  
BREAD, SAUSAGE (26)  
DUMPLING (26)  
SWEET POTATO (20)  
PLAINTAIN (17)  
CREAM OF WHEAT (16)  
WHITE POTATOES (14)  
BISCUITS (14)  
MACARONI & CHEESE (12)

TABLE 1: CONTINUED

STARCHES, CONT'D

BREAD, SARDINE (11)  
 POTATO SALAD (11)  
 RICE, CHICKEN (9)  
 MASHED POTATOES (8)  
 POTATO CHIPS (8)  
 BREAD, EGG, CUCUMBER (8)  
 BUN (7)  
 CASSAVA, BUGAMENT (7)  
 YAM (7)  
 CORN FLOUR CEREAL (7)  
 BREAD, MEAT (7)  
 OATS (7)  
 TOAST (6)  
 CEREAL (6)  
 CORN FLAKES (5)  
 PUMPKIN (5)  
 PANCAKE, FRITTER (5)  
 CRACKERS  
 RICE, SALT BEEF (4)  
 HAM ROLL (4)  
 BREAD, SAUS, EGG (3)  
 BREAD, EGG, BACON (3)  
 BEEF PIE (2)  
 BREAD, EGG, HAM, LETTUCE,  
 TOMATO & CUCUMBER (2)  
 BREAD, MACKEREL (2)  
 RICE, PORK (2)  
 MACARONI, BEEF (2)  
 DASHEEN (2)  
 BREADFRUIT (2)  
 FRENCH FRIES (2)  
 SPAGHETTI (1)  
 FISH DUMPLING SOUP (1)  
 CLUB SANDWICH (1)  
 ARROWROOT DRINK (1)  
 BREAD, SAUS, CHEESE,  
 CUCUMBER (1)  
 PIZZA (1)  
 RICE, MUTTON, OCTOPUS,  
 VEGS (1)  
 RICE, CHICKEN, FISH (1)  
 RICE, CHICKEN, PORK (1)

DAIRY FOODS

MILK (57)  
 OVALTINE (50)  
 CHOCOLATE MILK (44)  
 BREAD, CHEESE, BUTTER (36)  
 MILO (32)  
 BREAD, CHEESE (31)  
 MACARONI, CHEESE (12)  
 ICE CREAM (6)  
 BREAD, SAUSAGE,  
 CHEESE, CUCUMBER (1)  
 PIZZA (1)  
 COMPLAN (1)  
 COCOA (1)

VITAMIN A-CONTAINING  
FOODS

EGG (81)  
 MILK (57)  
 OVALTINE (50)  
 CHOCOLATE MILK (44)  
 BREAD, CHEESE, BUTTER (36)  
 MILO (32)  
 BREAD, CHEESE (31)  
 SWEET POTATO (20)  
 CARROT (18)  
 MACARONI, CHEESE (12)  
 PAPA YA (12)  
 MIXED VEGS (9) \*  
 BREAD, EGG, CUCUMBER (8)  
 GREEN PEAS, CARROTS (7)  
 VEG SALAD (6) \*  
 EDDO TOPS, SPINACH (6)  
 PEPPER POT (4) \*\*  
 BREAD, SAUS, EGG (3)  
 BREAD, EGG, BACON (3)  
 PAPA YA SALAD (2)  
 BREAD, EGG, HAM, CUC,  
 LETTUCE, TOMATO (2)  
 PIZZA (1)  
 COMPLAN (1)

TABLE 1: CONTINUED

VITAMIN C-CONTAINING  
FOODS

OVALTINE (50)  
 ORANGE JUICE (41)  
 MILO (32)  
 CABBAGE (26)  
 BANANA (26)  
 TOMATO (22)  
 PAPAYA (12)  
 "VEGETABLES" (10) \*\*\*  
 EDDO TOP, SPINACH (6)  
 ORANGE (5)  
 PEPPERPOT (4) \*\*  
 PINEAPPLE JUICE (3)  
 SOURSOP DRINK (2)  
 BREAD, BEEF, TOMATO (2)  
 BREAD, EGG, HAM, TOMATO,  
 LETTUCE & CUCUMBER (2)  
 PAPAYA SALAD (2)  
 TANGERINE (2)  
 COMPLAN (1)  
 TOMATO PASTE OR  
 SWEET PEPPER (42)

OTHER VEGETABLES  
& FRUITS

"JUICE"+++ (78)  
 FUNGEE (34) +  
 EGG PLANT/OKRA (21)  
 VEGETABLE SOUP (18)  
 CUCUMBER (18)  
 LEMONADE (16)  
 LIMEADE (12)  
 "VEGETABLES" (10)  
 SORREL DRINK (9)  
 MIXED VEGETABLES (9)  
 BREAD, EGG, CUCUMBER (8)  
 VEGETABLE SALAD (6)  
 BEET (4)

LETTUCE (4)  
 APPLES (3)  
 GRAPE JUICE (3)  
 SALAD (2)  
 GREEN BEANS (2)  
 DUMES (2)  
 SOURSOP DRINK (2)  
 BREAD, EGG, HAM, TOMATO,  
 LETTUCE & CUCUMBER (2)  
 PASSION FRUIT DRINK (2)  
 BREAD, SAUSAGE, CHEESE,  
 & CUCUMBER (1)  
 WATERMELON JUICE (1)  
 GRAPES (1)  
 ONION SOUP (1)  
 VEGETABLE SAUCE (1)  
 SQUASH (1)

\* Contains carrots  
 \*\* Contains stewed dark  
 green leafy vegetables  
 \*\*\* Contains tomato  
 + Contains okra  
 ++ Used as seasonings  
 +++ Mixed fruit drinks

TABLE 2: RANK ORDER CORRELATIONS  
 (KENDALL'S TAU B) STATISTICS FOR DIETARY ADEQUACY  
 SCORE AND SELECTED SOCIOECONOMIC VARIABLES  
 (CORRELATION COEFFICIENT/PROBABILITY)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1-DA SCORE	1.000 0.000									
2-BASIC	0.128 0.003	1.000 0.000								
3-RESP. EDUC.	0.154 0.002	0.121 0.008	1.000 0.000							
4-OCCUP. LEVEL	0.119 0.022	0.106 0.022	0.331 0.000	1.000 0.000						
5-SELL ANIMALS	0.134 0.010	0.072 0.124	0.069 0.213	0.068 0.232	1.000 0.000					
6-NUTR. ED.	-0.155 0.003	-0.145 0.002	-0.228 0.000	-0.091 0.111	-0.095 0.099	1.000 0.000				
7-# ROOMS	0.135 0.003	0.432 0.000	0.129 0.009	0.159 0.001	0.049 0.331	-0.175 0.001	1.000 0.000			
8-OWN CAR	0.120 0.023	0.185 0.000	0.206 0.000	0.194 0.001	-0.011 0.841	-0.091 0.120	0.208 0.000	1.000 0.000		
9-FISHING	0.122 0.020	-0.025 0.593	-0.036 0.523	-0.248 0.000	0.102 0.078	0.008 0.896	-0.032 0.527	0.081 0.163	1.000 0.000	
10-FRIEND	0.141 0.007	0.192 0.000	0.184 0.001	-0.026 0.645	0.147 0.011	-0.293 0.000	0.221 0.000	0.050 0.391	0.038 0.516	1.000 0.000

TABLE 3: FACTOR ANALYSIS OF SELECTED  
INDEPENDENT VARIABLES\*

<u>VARIABLE</u>	<u>FACTOR LOADINGS</u>			
	<u>FACTOR 1</u>	<u>FACTOR 2</u>	<u>FACTOR 3</u>	<u>FACTOR 4</u>
BASIC	<u>0.841</u>	0.026	-0.122	-0.035
# ROOMS	<u>0.806</u>	0.141	-0.148	-0.034
OWN CAR	<u>0.405</u>	0.558	0.113	0.350
SELL ANIMALS	0.369	<u>-0.550</u>	-0.131	0.082
RESP. EDUC.	0.161	<u>0.689</u>	-0.380	0.000
OCCUP. LEVEL	0.273	<u>0.616</u>	-0.028	<u>-0.458</u>
NUTR. ED.	-0.037	-0.119	<u>0.807</u>	0.094
FRIEND	0.194	-0.061	<u>-0.753</u>	0.099
FISHING	-0.008	-0.039	-0.021	<u>0.905</u>
<hr/>				
EIGENVALUE:	1.797	1.508	1.430	1.179
PROPORTION OF VARIANCE EXPLAINED BY EACH FACTOR:	0.200	0.168	0.159	0.131

$$\begin{aligned}
 &\text{TOTAL PERCENT OF VARIANCE ACCOUNTED} \\
 \text{FOR} &= (0.200 + 0.168 + 0.159 + 0.131) \times 100 \\
 &= 0.66 \times 100 \\
 &= \underline{66\%}
 \end{aligned}$$

\* Principle components method of extraction, orthogonal rotation, eigenvalue cut-off = 1.0. Variables used to interpret factors are underlined.

TABLE 4: STEPWISE MULTIPLE LINEAR REGRESSION  
OF DIETARY ADEQUACY SCORE ON  
ORTHOGONAL FACTORS

A. CORRELATION MATRIX (R/PROB.)

	(1)	(2)	(3)	(4)	(5)
1-DA SCORE	1.000 0.000	0.226 0.000	0.070 0.289	-0.167 0.011	0.063 0.337
2-FACTOR 1		1.000	0.000	0.000	0.000
3-FACTOR 2			1.000	0.000	0.000
4-FACTOR 3				1.000	0.000
5-FACTOR 4					1.000

B. REGRESSION EQUATION (VARIABLES ENTERED  
= FACTOR 1 AND FACTOR 3)

MULTIPLE R            0.2812  
R-SQUARE              0.0791  
ADJUSTED R-SQUARE   0.0711  
STANDARD ERROR      1.073

	<u>ANOVA</u>		
	DF	SS	MS
REGRESSION	2	22.862	11.431
RESIDUAL	231	266.197	1.152
	F = 9.920		
	SIGNIF F = .0001		

VARIABLES IN EQUATION

<u>VARIABLE</u>	<u>B</u>	<u>SE B</u>	<u>BETA</u>	<u>CORREL</u>	<u>PART CORR</u>	<u>PARTIAL</u>
FACTOR 1	0.2523	0.0703	0.2265	0.2265	0.2265	0.2297
FACTOR 3	-0.1857	0.0703	-0.1667	-0.1667	-0.1667	-0.1712

FIGURE 1: SCATTERPLOT OF  
STANDARDIZED RESIDUALS  
VS STANDARDIZED PREDICTED VALUES

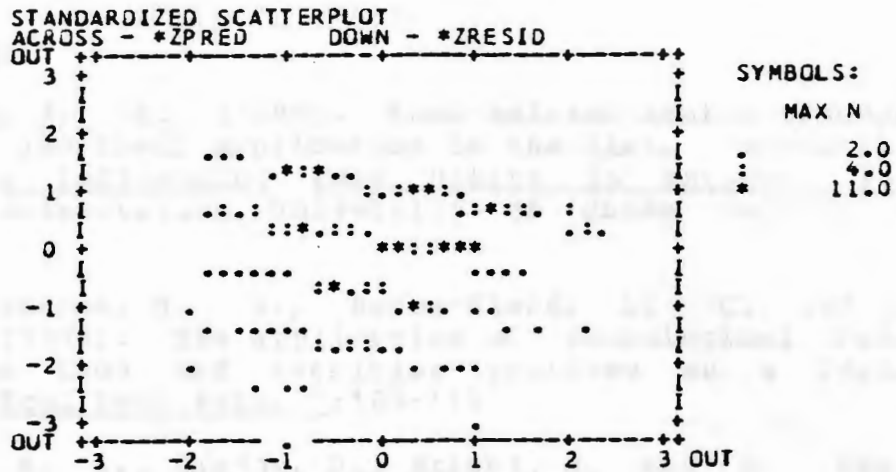


FIGURE 2: EXAMPLES OF  
SCATTERPLOTS OF PREDICTED VALUES  
VS ERRORS OF PREDICTION

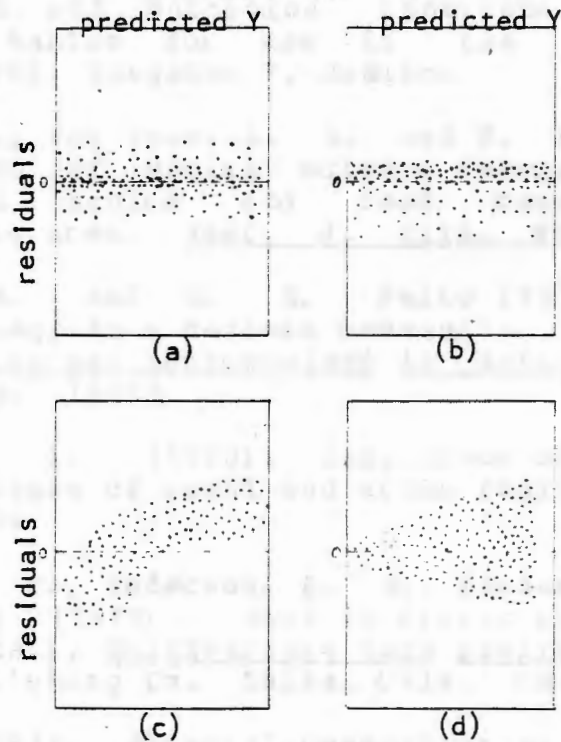


Figure 5.1 Plots of predicted values of the DV ( $Y$ ) against residuals, showing (a) assumptions met, (b) failure of normality, (c) nonlinearity, and (d) heteroscedasticity

From: B. G. Tabachnick, L.S. Fidell  
"Multiple Regression" Ch. 5, p. 86-144  
IN Using Multivariate Statistics  
Harper & Row, 1983



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## USING A MODEL IN FOOD HABIT RESEARCH

## INTRODUCTION

In recent years, awareness of the importance of sociocultural factors in food choice has led to a new discipline called nutritional anthropology. Its *raison d'etre* has been to examine food habits and their determinants. In some cases, theories about food habits have been tested through the use of a model. Sims (1978) proposed that an individual's consumption of available food is influenced by two major types of factors: external or environmental factors such as sociocultural influences and income, coupled with internal or endogenous factors such as knowledge, beliefs and values (Figure 1). Sims' objective was to determine the extent to which two groups exhibiting different food habits - vegetarians and non-vegetarians - could be differentiated by internal factors alone, such as their attitudes and beliefs about food. Caliendo et al (1976) used path analysis to test the appropriateness of a model that interrelated socioeconomic variables and preschooler dietary status. Models have also been used in a descriptive fashion for the purposes of historical (Jerome,

1981) or sociopolitical discussions (Robson et al, 1972) of food patterns.

The model approach is a particularly useful one for food and nutrition scientists for several reasons:

1. these scientists are seldom trained in anthropology.

2. the model condenses a vast amount of information and knowledge in a way that is efficient and in accordance with current scientific thought.

3. a model is a necessary first step in a methodical approach to the examination of food-related socio-cultural factors in any setting.

Food habit research may be conducted for the purposes of theoretical discussion or to meet practical goals. Examples of possible theoretical applications of a food habit model have already been given. One important practical application of a model is to collect information about the likelihood of change in food habits to meet food or nutrient needs that have been identified in a particular group.

In the first part of this paper, a cross-cultural food habit model is presented. Examples of the use of the model are demonstrated with data collected by survey questionnaire in Antigua, the West Indies from December, 1981 to January,

1982. Although a discussion of statistical analysis is beyond the scope of this paper, examples of data analyses which can provide practical information or evidence for theoretical discussion are given in the second part of the paper.

## A CROSS-CULTURAL FOOD HABIT MODEL

### A. Definition

Food habit determinants discussed in a wide cross-section of anthropology, nutrition and food science literature were reviewed by the investigator and summarized into a food habit model shown in Figure 2. Determinants were placed under one of four broad headings or factors: compatibility, affordability, competitiveness and availability. Compatibility is the cultural definition of food and its place in the home. Examples of this factor include group or individual rules about what is and is not eaten, how a food fits into the individual, family or community lifestyle and any attributes which give a food a perceived cultural value. Affordability is the perceived cost to the family or individual of procuring the food. Perceived cost is a function of elements such as purchasing power (income, property, goods or services useable in the

purchase of food), preparation time, energy and labor. Food availability is another important consideration in the development of food patterns and is defined as the source and supply of food. It functions at several levels: natural occurrence of the food, environmental and technical food production capability and food distribution at the national, regional, local and household levels. Competitiveness deals with factors contributing to competition between food products, food-related technologies or family members for food, for the purpose of assessing the likelihood of food habit change. As an application of selected model concepts, it will be discussed in the next section.

Many potential interactions of concepts are implied by the model. An interaction of availability with compatibility might be seen in ceremonial activities in which food beliefs restrict the individual's selection of foods among those foods available through normal production or purchase. The interaction of affordability and availability might be seen in the effect of a family's purchasing power, time and labor on its ability to grow crops. For any social situation, many such interactions may be hypothesized and tested for their relationship to food habits.

B. Application: data from Antigua, W.I.

Although the hypothetical food habit determinants reviewed in the last section are empirically derived and even intuitively logical, the model must be tested in a series of social situations in order to be refined and/or corrected. Data from a food habit survey conducted in Antigua, W.I. served as a first test.

Antigua is an island in the Eastern Caribbean with an area of 108 square miles and an English-speaking population of approximately 75,000. Two survey areas, the capital city of St. John's, including its suburbs, and the rural Parish of St. Mary's, were selected to furnish an urban-business/traditional-agricultural contrast in lifestyle possibly leading to differences in food habits.

One respondent from each of 305 households - 150 from villages in the Parish and 155 from St. John's - was interviewed. Data were collected on food purchase, production, consumption and beliefs and socioeconomic characteristics of respondents and household members. Effort was made not only to collect appropriate information representing factors in the model, but also to collect data which could contribute to the testing of current theories

discussed in the literature. The following sections describe in more detail the ways in which food compatability, affordability, competitiveness and availability were operationalized and applied in the Antigua setting.

### 1. Compatability

Information on the cultural definition of food and its place in the home was collected via a 24-hour recall and questions about food-related beliefs. Twenty-four hour recall data for a random sample of 305 respondents was presumed to cover the range of foods usually eaten by the general population. Food beliefs and perceptions were elicited by asking respondents two questions: "If you had more money to spend on food only, what foods would you buy and why" and "Are there any foods that individuals in your household avoid or don't eat for some reason and why." The answers to these questions revealed information on food-related health concepts, religious beliefs concerning food and the extent of food avoidance in the respondents' own words. Respondents were also asked to rank the importance to them of selected concepts such as "family likes the food" and "its good for you" when purchasing or growing food. How a food fits into the home is partly a



function of food-related home technology, or the technical capacity for food preparation, preservation and storage. This was partially assessed in Antigua by an inventory of food-related equipment in the home including major kinds of cooking equipment and a refrigerator. Because the nutrition education of the person in the household who prepares the food has a potential effect on food selection, handling and the food-related perceptions of household members, this factor was included in the questionnaire.

## 2. Affordability

"Affordability" in the Antigua study was examined from both emic and etic perspectives: first, respondents' perceptions of the cost of selected foods and the importance to them of saving money and labor when purchasing or growing food; and second, the occupational level of the chief wage earner in the household, the marketing of food raised by the household, house size and household wealth assessed via asset ownership. An adaptation of the modified semantic differential test board (Dewalt and Pelto, 1977) was the device upon which respondents ranked, from 1 to 7, their perception of the cost of selected foods (1 = inexpensive, 7 = very expensive), or the importance of saving money or labor when purchasing or growing food (1 = unimportant, 7 =

very important). Data collected in such a way can be correlated with other variables to identify interrelated factors. In this case, it is important to choose food characteristics or values from the emic perspective; in other words, to use the local terms for objects and concepts. As an indicator of relative income and wealth, factors such as occupational level, the income in money or food from marketing food produced by the household, the number of rooms in the house and asset ownership were included. Asset ownership was measured by the presence in the household of 20 selected items including traditional and modern cooking appliances, a refrigerator, indoor and outdoor plumbing and recreational items such as a television, stereo and vehicle.

### 3. Availability

Assessing the availability of a food resource is a task that involves objective as well as subjective data. The natural occurrence of a food source or the proximity to the supply of a food can be inventoried or projected from other data such as food import, crop production and food purchase data. The 24-hour recall was the major source of information on foods available to respondents through acquisition and on preparation method. However, because

people's perceptions of food availability may be quite different from what an inventory implies, respondents were asked to rank the availability of selected foods. This was accomplished by using the test board previously described with "availability" replacing "cost."

#### 4. Food habit change: Competitiveness

One major application of the cross-cultural food habit model is in the area of food habit change. Although compatibility, affordability and availability are factors that can be applied to a study of food habit change, the competition between food products, food-related technologies or family members for food is of special interest in this context.

The perceived advantage of one food over another can contribute to competition between foods. One way to measure relative advantage is to consider both the emotional importance of foods and their frequency of consumption. Passim and Bennett (1943) pioneered this approach in which universally eaten, staple items and the most emotionally important foods are labeled "core" foods, "secondary core" foods differ from "core" foods by being widespread rather than universal in use, and "peripheral" foods are infrequently consumed and have the least emotion attached to

them. Resistance to change is hypothesized to increase with progression from peripheral to secondary core to core foods (Sanjur, 1982). An analysis of diets using this format can be useful in anticipating the relative difficulty of food change. Even if little or nothing is known about the emotional values attached to food in a culture, the relative frequency of consumption of various foods gives an idea as to the items that are central versus peripheral to the diet, for whatever reasons. In the Antigua study, 24-hour recall data were used for this purpose in a analysis resembling Jerome's (1975) analysis of the diets of English-speaking South Caribbean islanders. Individual food consumption was divided into the appropriate time periods (am, noon or pm). Within each time period, frequencies of specific foods consumed gave an indication of the "primary," "secondary" and "peripheral" meats, starches, vegetables, and other items. Combinations of different types of foods consumed by all respondents within each time period were noted and frequencies of such patterns tallied (Table 1). Such an analysis not only reveals relative prominence of foods and food patterns at various times, but also the relative variety of core versus secondary core versus peripheral foods and the tendency of certain nutrient-rich foods to be concentrated at one meal time versus another.

## 5. Different levels of analytical results

### a. Practical

With the cross-cultural food habit model as a guide, descriptive information that is useful to many nutrition education and food development programs can be collected. Data collected in Antigua revealed that the Antiguan diet is starch-based, and that, despite crop production by about two-thirds of the households sampled, many diets appeared to be deficient in selected fruit and vegetable groups. Diets appeared to be adequate in protein, with reliance on fish, egg, chicken and pork. A small percentage of sample households were fishing or raising animals for food. Most households shopped for food several times a week and utilized local shops, the traditional open vegetable and meat market and/or one of the two supermarkets that provide imported foods for the tourist trade. On a product by product basis, diets appeared to be a mixture of locally produced items or traditional foods, such as saltfish and local vegetables, and other imported items, such as Ovaltine, canned milk, sausage, canned fish, Cream of Wheat and pasta. The use of fortified food beverage powders such as Ovaltine was so widespread that it was selected as an appropriate subject for an in-depth study which is

summarized here.

Approximately 27% (82) of the respondents reported consuming a fortified food beverage powder - Ovaltine, Complan or Milo - that they mixed with milk, water, tea and/or other optional ingredients. An analysis was performed to ascertain: 1) what, if any, nutritional effect the consumption of a standard serving of the powder had on the one-day diets of those respondents consuming it and 2) what, if any, socioeconomic differences existed between consumers of the powders and non-consumers. In the first part of the analysis, all 164 foods listed as consumed by the entire sample via 24-hour recall were placed into six food categories according to their nutrient content (CFNI, 1974): Protein foods, Starches, Dairy foods, Vitamin A-containing foods, Vitamin C-containing foods and Other fruits and vegetables. A Dietary Adequacy Score was given to each individual according to the number of different categories represented in his or her one-day intake. The second part of the analysis identified the socioeconomic groups that were consuming the powders. Results indicated several things: that the respondents taking the powders had a lower average score than the sample as a whole for their one-day intakes when the effect of the powder was subtracted out; that the powders supplemented most of the diets with

one or more of the selected food groups found to be limiting in the sample's dietary profile; that respondents of any age, sex and identifiable socioeconomic background were likely to be using the powders and that, by implication, commercial advertising for these products had been very effective throughout the population.

These results imply several things that may be useful in planning food and health programs in Antigua: many Antiguan are receptive to food-related health concepts; many are willing to pay for a perceived health benefit, and that cost-nutritional benefit analyses of food choices might be one constructive way to reduce Antiguan's food bills.

#### b. Theoretical

Another objective for conducting food habit research, the testing of theories across cultures, was demonstrated by further analysis of the Antigua data. In this analysis, the controversy about the predominance of socioeconomic versus ideological factors in the determination of food behavior patterns was examined. A brief review of this controversy follows.

Socioeconomic factors deal with "economic, political and structural features," while ideological factors involve "the role of cultural beliefs" (Dewalt and Pelto, 1977).

Some investigators report that beliefs may be stronger motivators of food habits than economic considerations. A study of six villages in the rural Philippines found no significant relationship between occupation and child nutritional status (Taylor et al, 1978). The authors hypothesized that children of that culture may be of such high value that parents try to meet the child's needs regardless of income. There is also the classic Hindu practice of cow protection in some areas of the world, persisting even amidst hunger and impoverished grazing grounds (James, 1979). It has even been suggested that, since man has faced uncertainty and fear throughout history in his search for food, he has been motivated to develop beliefs, superstitions and practices which give him the feeling of some control over his food supply (Shifflett, 1976). By contrast, some researchers present strong evidence that socioeconomic factors, particularly economic ones, may be the major determinants. For example, despite the successful introduction of nutrition concepts in several poor communities in Mexico, individuals were unable to easily change their diets due to their extremely poor economic condition (de Chavez, 1972). Lillig and Lackey (1982) found that, among mothers in a subtropical Mexican valley, the most common reason given for breast-feeding



infants was that breast-feeding was the most inexpensive method. There is also evidence that economic and ideological determinants can be linked. For example, an individual facing a short term financial crisis cuts back on food - but on the foods that aren't important to him (McKenzie, 1974). In the classic study by Cassel (1957), diets among Zulu residents of a reserve were gradually improved by initiating a combination of economic and psychological motivations for food habit change, depending on the food involved. Egg consumption was increased after families saw that they could increase production to provide eggs for eating as well as to perpetuate chicken stocks. By contrast, the same community held very deep-seated beliefs regarding the consumption of milk from local cows and was persuaded to use imported powdered milk only after a way could be found to disassociate this milk ideologically from the milk produced locally.

In the analysis of the food habit determinants operating in Antigua, the Dietary Adequacy Score described in the last section became the dependent variable in an analysis testing the likelihood that selected socioeconomic variables were linearly related to dietary adequacy. Socioeconomic variables hypothesized to be significant in the Antigua setting included household size, composition,

food resources, wealth and relative level of occupation, the level of education attained (general and nutrition) by selected household members and cosmopolitaness (degree of exposure to new ideas) of the respondent and/or household members. A subset of these variables was selected for use in a multiple linear regression analysis based on the magnitude and significance ( $p < .05$ ) of the rank correlation (Kendall's tau b coefficient) of each with the dependent variable. However, it was apparent that the rank correlation coefficients between several of the independent variables were of greater magnitude and/or significance than the coefficients between those variables and the Dietary Adequacy Score (multicollinearity). Factor analysis using orthogonal rotation was selected as a means to reduce the number of independent variables to a set of theoretical constructs that were uncorrelated with each other. Two of the four resulting factors were linearly related to the Dietary Adequacy Score. These factors were interpreted as household wealth, including the number of rooms in the respondent's house and asset ownership, and exposure to new ideas, including the nutrition education of the food preparer and the respondent having a friend from overseas. Thus, ideological factors as well as economic ones appear to influence Antiguan diets.

This analysis not only provides evidence for theoretical discussion, but also practical implications for food programs. The household wealth factor, which implies relative ability to purchase foods, is important on an island where the major food spending is on imported products such as cereals, meats, dairy foods and sugar (McIntosh, 1978). Very few of these kinds of products are produced locally. In addition, with the variety and, to some extent, quantity of foods made available to Antiguan by the presence of the tourist trade, it would seem likely that consumption of imported foods is partly a function of cost and exposure to the foods. This exposure could include the use of those foods demonstrated by others or commercial advertisement. The results also have practical implication for government efforts such as the stimulation of local food production for consumption in order to reduce food costs. For example, instruction on the nutritional value and preparation of traditional or local foods in school and the promotion of national pride in traditional food habits might be used in conjunction with financial incentives to produce crops and/or animals.

Although the multiple linear regression model was appropriate for the data, a relatively small proportion of the variance in the dependent variable was explained

(R-square = 0.079). This indicates that further analysis should be performed. In doing this, several options can be considered: one, a different set of variables representing the model concepts hypothesized to be significant in Antigua could be chosen; two, the set of variables measuring a selected concept could be expanded; and three, better dietary data could be used, ie quantitative data for either one-day or multiple-day intakes. The first objective involves identifying new variables that explain some of the variance in dietary adequacy and the second involves focusing on areas already determined to be significant. In effect, the analysis has pointed to two concepts of importance in Antigua: household wealth and the exposure to new ideas. A logical next step might be to focus on these concepts and expand the information about them by selecting alternative variables measuring those concepts from data already collected. The linear regression model appears to be an appropriate one for testing the likelihood of a relationship between independent variables and Dietary Adequacy.

#### SUMMARY

The model approach to food habit research is useful

because it summarizes current knowledge in a form that expresses potential food habit determinants in cross-cultural terms and suggests a methodology for studying food habits and their determinants. The concepts in the cross-cultural food habit model presented in this paper were derived from a thorough reading of the literature. It was stressed that applications of the model should include research supporting theoretical discussion, as well as the practical research needed for food development programs. As examples of these two objectives, data from a food habit survey conducted in Antigua, W. I. was analyzed. One analysis provided a description of food habits in Antigua with emphasis on the use of a commercially-prepared fortified food beverage, its effect on the nutritional profile of the diets of respondents using it and a socioeconomic profile of the respondents using the product. In a second analysis, two factors, household wealth and the exposure to new ideas, were found to be linearly related to a Dietary Adequacy Score. The theoretical and practical significance of these results and options for further research were discussed.

TABLE 1: 24-HOUR RECALL INTAKES:  
MEAL PATTERN ANALYSIS

A. PRIMARY, SECONDARY AND PERIPHERAL  
FOODS AT EACH MEALTIME

1. AM FOOD PATTERNS, N = 290

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>MEATS</u> NO.* = 168 TYPES** = 17 INDIV+ = 129	EGG (77)	PORK (30) SALTFISH (22)	SAUSAGE OR BACON (8) BEEF (6) CHICKEN (4) FISH & VEGS (4) SARDINE (3) HAMROLL (3) PIG FEET (3)
<u>STARCHES</u> NO. = 153 TYPES = 9 INDIV = 146	BREAD W/BUTTER (135)	-	TOAST (5) BISCUITS (3) CRACKERS (3) RICE (3)
<u>BREADS</u> NO. = 86 TYPES = 11 INDIV = 86	BREAD & CHEESE (37)	BREAD & SAUSAGE (17)	BREAD + EGG + CUCUMBER (8) BREAD + SARDINE (9) BREAD + MEAT (4) BREAD + SAUSAGE + EGG (3) BREAD + EGG + BACON (3)
<u>VEGETABLES</u> NO. = 52 TYPES = 9 INDIV = 41	TOMATO (16) CUCUMBER (14) EGGPLANT OR OKRA (12)	-	"VEGETABLES" (4)
<u>FRUITS</u> NO. = 28 TYPES = 8 INDIV = 23	BANANA (14)		ORANGE (5) PAPAYA (4)

TABLE 1: CONTINUED

## 1. AM FOOD PATTERNS, CONTINUED

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>CEREALS</u> NO. = 35 TYPES = 5 INDIV = 35	CREAM OF WHEAT (11) OATS (2)	"CEREAL" (3) CORN FLOUR CEREAL (5)	CORNFLAKES (4)
<u>MILK</u> NO. = 78 INDIV = 76	PLAIN (37) CHOCOLATE (41)	-	-
<u>BEVERAGES</u> NO. = 161 TYPES = 17 INDIV = 152	TEA (MILK AND SUGAR) (75)	COFFEE (23) "JUICE" (17) ORANGE JUICE (16)	LEMONADE (5) WATER (7) SODA (7)

## 2. NOON FOOD PATTERNS, N = 241

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>MEATS</u> NO. = 201 TYPES = 31 INDIV = 175	CHICKEN (55)	SALTFISH (19) BEEF (18) FRESH FISH (15) CHICKEN & VEGS (15)	PORK (6) FISH & VEGS (7) CHICKEN & RICE (6) CHICKEN VEG SOUP (7)
<u>LEGUMES</u> NO. = 36 TYPES = 3 INDIV = 36	RICE & BEANS (30)	PEAS (5)	BEANS (1)
<u>STARCHES</u> NO. = 110 TYPES = 11 INDIV = 101	RICE (27) BREAD & BUTTER (24)	FUNGEE (14) DUMPLING (11) MACARONI (10) MACARONI & CHEESE (9)	BISCUITS (7) BUN (6)
<u>BREADS</u> NO. = 34 TYPES = 7 INDIV = 34	BREAD & CHEESE (17)	BREAD + SAUSAGE (10)	BREAD + SARDINE (3) BREAD + MACKEREL (2)

TABLE 1: CONTINUED

## 2. NOON FOOD PATTERNS, CONTINUED

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>VEGETABLES</u>	CABBAGE (13)	- MIXED VEGS (6) -	
NO. = 76	RICE	- VEG SOUP (6) -	
TYPES = 19	& VEGS (12)	- EGGPLANT/OKRA (5) -	
INDIV = 61	CARROT (9)	- TOMATO (4) -	
<u>STARCHY</u>			
<u>ROOT CROPS</u>	SWEET POTATO (8)	- YAM (4) -	
NO. = 42	PLAINTAIN (7)	- MASHED POTATOES (4) -	
TYPES = 10	POTATO		
INDIV = 32	SALAD (6)		
	WHITE		
	POTATOES (5)		
<u>FRUITS</u>	BANANA (5)	PAPAYA (3)	PAPAYA
NO. = 10			SALAD (1)
TYPES = 4			APPLES (1)
INDIV = 10			
<u>CEREALS</u>	CREAM	"CEREAL" (3)	CORNFLAKES (2)
NO. = 15	OF WHEAT (4)	CORN FLOUR	
INDIV = 15	OATS (5)	CEREAL (1)	
TYPES = 5			
<u>BEVERAGES</u>	"JUICE" (40)	MALT (20)	SODA (13)
NO. = 120			ORANGE
TYPES = 16			JUICE (10)
INDIV = 115			WATER (7)
			LIMEADE (6)
			GINGER BEER (5)



TABLE 1: CONTINUED

## 3. PM FOOD PATTERNS, N = 243

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>MEATS</u> NO. = 193 TYPES = 32 INDIV = 180	CHICKEN (40)	SALTFISH (24) FRESH FISH (27) BEEF (15) PORK (11) FISH & VEGS (10) CHICKEN & VEGS (9)	MUTTON (6) CHICKEN VEG SOUP (6) PICKLED MACKEREL (5) PIG FEET (4)
<u>LEGUMES</u> NO. = 26 TYPES = 3 INDIV = 26	RICE & BEANS (21)	- BEANS (1) - - PEAS (4) -	
<u>STARCHES</u> NO. = 129 TYPES = 12 INDIV = 125	BREAD W/BUTTER (32)	RICE (24) MACARONI (22) FUNGEE (18) DUMPLING (14)	BISCUITS (5) MACARONI & CHEESE (5) PANCAKE FRITTER (4)
<u>BREADS</u> NO. = 31 TYPES = 6 INDIV = 29	BREAD & CHEESE (16) BREAD & SAUSAGE (10)	- BREAD + EGG + CUC (1) - - BREAD + BEEF + TOMATO (1) - - BREAD + MEAT (3) -	
<u>VEGETABLES</u> NO. = 77 TYPES = 16 INDIV = 63	RICE & VEGS (14) CABBAGE (11)	VEG SOUP (9) CARROT (7) EGGPLANT OR OKRA (6) PEAS & CARROTS (5)	"VEGETABLES" (4) MIXED VEGS (3) LETTUCE (3)

TABLE 1: CONTINUED

## 3. PM FOOD PATTERNS, CONTINUED

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>STARCHY</u>			
<u>ROOT CROPS</u>	SWEET	POTATO	-
NO. = 47	POTATO (11)	SALAD (5)	
TYPES = 11	PLAINTAIN (9)	MASHED	
INDIV = 37	WHITE	POTATOES (4)	
	POTATOES (7)	CASSAVA	
		/BUGAMENT (4)	
		YAM (3)	
<u>FRUITS</u>	BANANA (5)	PAPAYA (4)	APPLES (1)
NO. = 11			DUMES (1)
TYPES = 4			
INDIV = 11			
<u>CEREALS</u>	CORN FLOUR	CREAM	-
NO. = 3	CEREAL (2)	OF WHEAT (1)	
TYPES = 2			
INDIV = 3			
<u>BEVERAGES</u>	"JUICE" (28)	ORANGE	MALT (9)
NO. = 117		JUICE (16)	LEMONADE (9)
TYPES = 18		WATER (11)	SODA (5)
INDIV = 100		TEA (MILK	GINGER BEER (5)
		& SUGAR) (16)	LIMEADE (6)

TABLE 1: CONTINUED

## B. MEAL PATTERNS

1. AM FOOD PATTERNS, N = 290

PATTERN I (75): MEAT + STARCH + BEVERAGE OR MILK  
 PATTERN II (62): BREAD + BEVERAGE OR MILK  
 PATTERN III (35): STARCH + BEVERAGE OR MILK  
 PATTERN IV (25): MEAT + STARCH + VEG/FRUIT + BEVERAGE  
 OR MILK  
 PATTERN V (15): CEREAL + MILK + BEVERAGE  
 TOTAL = 212

2. NOON FOOD PATTERNS, N = 241

PATTERN I (38): MEAT + STARCH + BEVERAGE  
     (12): MEAT + STARCH + VEGETABLE  
     (13): MEAT + STARCH + VEG/STARCHY ROOT  
           CROP  
     (4): MEAT + STARCH + VEG/BREAD  
 PATTERN II (28): MEAT + BEVERAGE  
 PATTERN III (19): MEAT + LEGUME  
     (4): MEAT + LEGUME + VEG  
     (2): MEAT + LEG + VEG + STARCH  
     (2): MEAT + LEG + VEG + STARCH + STARCHY  
           ROOT CROP  
     (3): MEAT + LEG + BREAD  
     (2): MEAT + LEG + STARCH  
 PATTERN IV (20): BREAD + BEVERAGE  
 PATTERN V (18): MEAT + VEGETABLE + BEVERAGE  
 PATTERN VI (14): STARCH + BEVERAGE

TABLE 1: CONTINUED  
 B. FOOD PATTERNS, CONTINUED

2. NOON FOOD PATTERNS, CONTINUED

PATTERN VII(9): MEAT + STARCHY ROOT CROP + BEVERAGE  
 PATTERN VIII(5): CEREAL + MILK  
           (3): CEREAL + MILK + MEAT + STARCH  
           (2): CEREAL + MILK + MEAT + STARCH + VEG  
                   OR FRUIT  
 TOTAL = 198

3. PM FOOD PATTERNS, N = 243

PATTERN I(55): MEAT + STARCH + BEVERAGE  
           (10): MEAT + STARCH + STARCHY ROOT CROP  
           (4): MEAT + STARCH + BREAD  
           (3): MEAT + STARCH + FRUIT  
 PATTERN II(20): MEAT + STARCH + VEG + BEVERAGE  
           (2): MEAT + STARCH + VEG + STARCHY ROOT  
                   CROP  
           (3): MEAT + STARCH + VEG + FRUIT  
 PATTERN III(23): MEAT + BEVERAGE  
 PATTERN IV(15): STARCH + BEVERAGE  
 PATTERN V(17): BREAD + BEVERAGE  
 PATTERN VI(11): MEAT + LEGUME + BEVERAGE  
           (6): MEAT + LEG + VEG/STARCHY  
                   ROOT CROP  
           (5): MEAT + LEG + STARCH OR BREAD  
           (3): MEAT + LEG + STARCH + VEG/STARCHY  
                   ROOT CROP  
 TOTAL = 177

- \* Total number of items listed per category
- \*\* Total variety of items listed per category
- + Total number of individuals who listed the items

FIGURE 1: FOOD HABIT MODEL BY SIMS (1978)

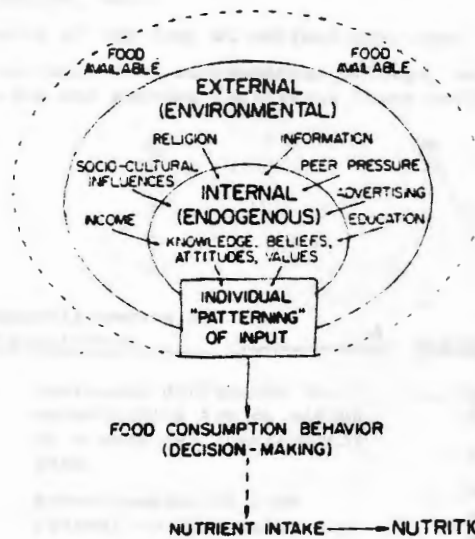
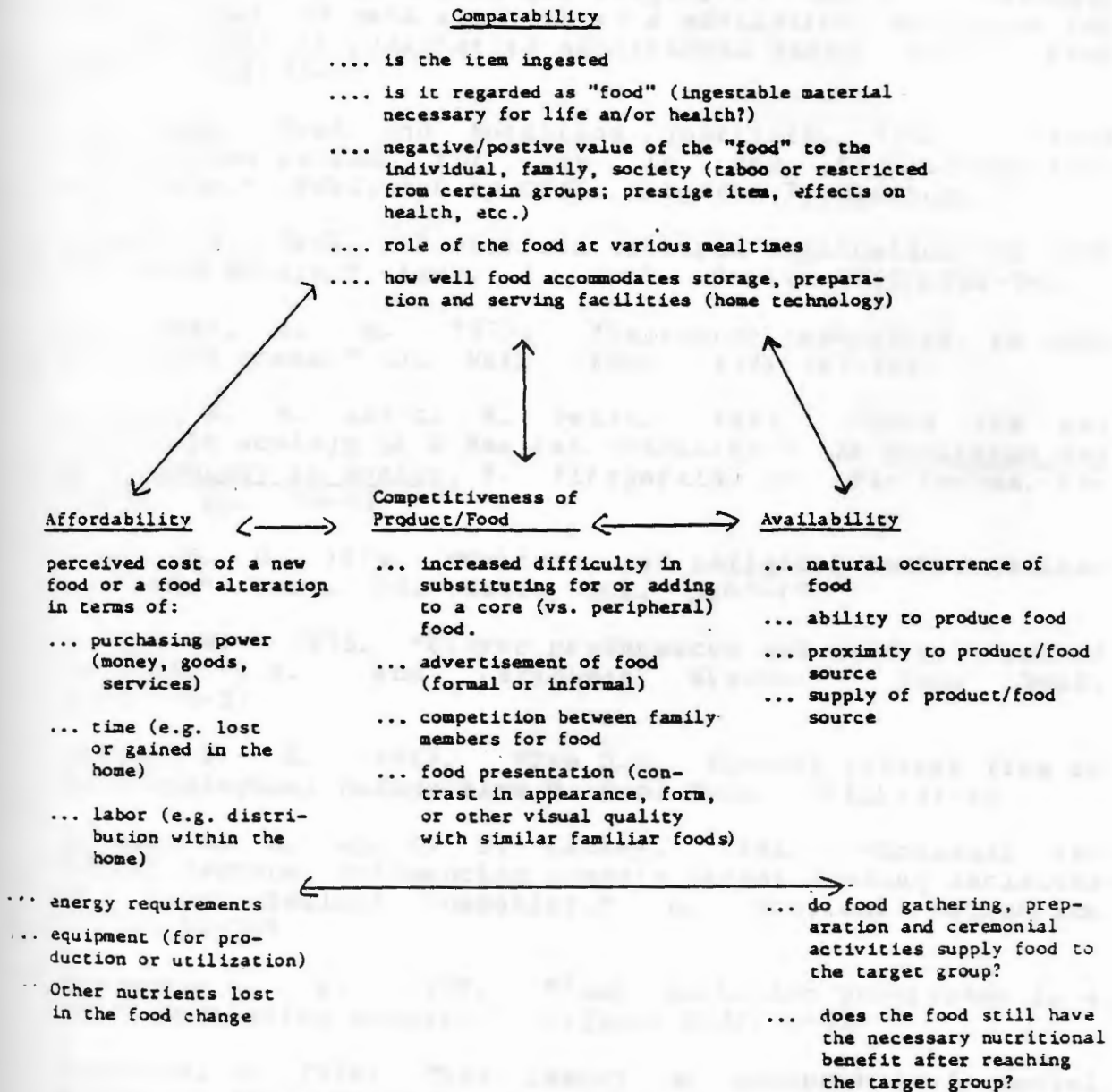


FIGURE 1 Conceptual framework: Influences on food consumption behavior.

From: "Food-related Value-orientations, Attitudes, and Beliefs of Vegetarians and Non-vegetarians"  
Ecol Food Nutr 7:23-35, 1978

FIGURE 2: FOOD HABIT MODEL



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## Literature Review

### Introduction

Food habits, the outcome of all influences exerted by activities, feelings, thoughts and beliefs concerning food practices, (Devadas, 1970), exhibit an astonishing diversity from culture to culture. Nevertheless, the food habits of any group of people, from the household to the national level, are a function of basic determinants which operate selectively in all cultures and which foster continual change.

Food habit change on different time scales has been well documented. For example, man's transition over millenia from a hunter-gatherer to a peasant farmer brought about certain dietary changes (Robson, 1976). The introduction of potatoes, maize and coffee into Europe took generations (Gordon, 1974); however, one impact of urbanization in the South Pacific has been to rapidly replace some traditional foods and child feeding practices with European vegetables, canned products and bottle-feeding, resulting in significant health changes in just one decade (Lambert, 1982). Another short-term change is the "end of the month" syndrome, or the drastic changes

in food purchases during the period of time after a household has run out of money and before more income is available, and the nutritional consequences of this change (Bode et al, 1974). In adjusting to short-term crises such as illness or unemployment, people often cut back on food first because it is more flexible than rent or utilities (McKenzie, 1974).

By contrast, the influences shaping food habits and their change are harder to document, especially in cross-cultural terms. There is the difficulty of identifying all possible factors which may affect food choice and consumption within a culture, a task which may rely on research by a variety of experts. There may be subtle expressions of certain cultural factors such as food beliefs which are not fully understood by the researcher, who has his own cultural biases. One way to organize and simplify the task of identifying influences on food habits is to use a model which summarizes possible influences and provides a means to formulate hypotheses about their effects on food habits.

#### The Model Approach to Food Habit Research

There are different examples of models in the literature which attempt to explain food habits or food

consumption behavior. Each type of model takes a holistic approach in considering all possible food habit determinants. As an introduction to model construction and a context in which to analyze different types of models, a review of Jonsson's (1981) analysis of the causes of hunger is presented.

Jonsson (1981) used an approach to analyzing the causes of hunger which is not a model itself, but a guide to constructing a model to identify the causes of hunger in a given situation. The fundamental parts of his analysis are three: the depth of analysis, which dictates whether one is looking at symptoms and signs of the problem or its immediate, underlying and basic causes; the type of basic cause, including historical, ecological, economic and ideological causes; and the level of society at which the causes may exert their effect, from the international down to the individual level. This analytical scheme is designed to facilitate a methodology for identifying hunger itself, as well as its causes, by separating out its symptoms (eg., birth weight) and immediate causes (eg., dietary intake) from its underlying and basic causes. Jonsson points out that, although hunger is always manifested at the individual level, any of the underlying or basic causes of hunger can theoretically operate at any level of society, such as the

community or regional level. A model can be constructed from any combination of the three parts of the analysis, eg how various levels of society interact with a basic cause.

Jonsson's approach is a useful one for analyzing other models in the literature. For example, Robson (1972) designed a model in which health is the focal point of such interrelated factors as population, land and agriculture policies, food availability, marketing, economic status and habits and customs. Without separating out the level of society as a dimension of the analysis, as Jonsson did, the model implies interactions at various levels of cause and effect. For example, large-scale events, such as changes in international relations or warfare, may have nutritional implications directly or indirectly through policy changes.

For a historical perspective on food habits, Jerome (1981) designed a model to thematically relate and explain the evolution of different food production tools and habits of native Americans within specific cultural periods occurring in the last 15,000 years. In her five component model, culture idea systems emerge from the way the social environment is organized, and give rise to new technological means of dealing with the physical environment. Each of these components may affect, or be affected by, individual biological and psychobiological needs.

The aforementioned models are useful as springboards for theoretical or thematic discussions of food habits. The next step, however, is to design and test models which adequately describe the cultural context of specific food behavior.

The models by Sims (1978a) and Caliendo et al (1976) were designed to investigate specific dietary patterns: factors that shape vegetarian versus nonvegetarian food selection and preschooler dietary quality, respectively. Sims was interested in ideological and cultural causes of food selection at the individual level. Her model hypothesized that "external" and "internal" influences are all filtered through the individual's "patterning of input" to result in decision-making and food selection among available foods. The "external" influence is composed of such underlying and basic causes as culture, education and income. However, Sims' emphasis was on the "internal" influence on food habits, manifested as individual attitudes values and beliefs. By analyzing the responses of vegetarians and nonvegetarians to statements expressing food-related attitudes and values, Sims showed that groups differentiated in food habits can also be differentiated in food-related attitudes and beliefs.

Caliendo et al (1976) hypothesized that influences on

preschooler dietary quality (a score evaluating a child's intake with reference to the basic four food groups) included ecological and ideological factors at the household level (ie family resources), maternal psycho-social variables and preschooler characteristics. Using path analysis, these factors were tested for predictive influence, directly and indirectly, on preschooler dietary quality and nutritional status. The results yielded a refined model diagramming the interactions of variables at the household level which affect preschooler diet and health.

Detailed models can be designed to reflect the social influences on food behavior as accurately as current knowledge and statistical practice will allow. Models such as the ones by Sims and Caliendo et al describe food habit determinants in a specific social situation. Given the usefulness of the model approach to food habit research, there is a need for a food habit model which can serve as a prototype and guide for studying the cultural context of food behavior in any setting. This prototype must fulfill the following requirements:

1. include all interactions of causes (underlying and basic) with level of society that might affect food habits and food habit change,

2. present those interactions in the form of practical questions or considerations about food habits,

3. express those questions and considerations in terms applicable to any culture,

4. allow hypothesis-testing for the purpose of refining such a model to fit or define a given social situation.

#### A Cross-cultural Model of Food Habit Determinants

The model presented in figure 1, derived from an extensive review of the literature, shows interactions of the elements of four categories of food habit determinants. These categories, "compatibility," "affordability," "competitiveness" and "availability," are hypothesized to encompass the range of variables potentially involved in food habit change at any level of society. The following discussion supports these ideas.

##### A. Compatibility

Compatibility is the cultural definition of food and how a food fits into the individual, family or community life. As part of the cultural definition of food,

compatibility includes any attributes which give a food a perceived value.

What is regarded as "food" is a product of first the physical environment and then cultural definition (Wenkam, 1969). Further, there can be differentiation between a subset of foods with certain cultural values and the larger set of all edible materials. For example, Wolff (1964) reported that Malays define food as edible items essential to life. It is believed that rice is necessary for survival and meats give strength and health - these are "foods" because they have life-giving properties. However, vegetables are used only to improve the taste of other dishes and fruits are snacks "to keep the mouth busy." Thus, according to belief, a Malay could live without vegetables or fruits, but not without rice or meat. If dietary changes are being considered in a situation such as this, the researcher must be aware of the difference between his/her food perceptions and those of the target group.

Another important element of food "compatibility" involves food beliefs. A food belief is a cultural concept related to other aspects of the value system and is imbued with emotion (Niehoff, 1967). As such, it can define what is or is not a food, particularly with respect to religious practices. Food beliefs can define various groups within a



society and form a basis of interaction between them through dialogue and reciprocity (de Garine, 1970).

Sometimes food concepts acquire strongly positive or negative values for an individual or group. A food taboo is an example of a negative food belief, originally the practice of protecting a sacrosanct food from common use (James, 1979). Today the concept of food taboo applies to restrictions on the food intake of certain individuals or groups, with serious sanctions should the "rules" be broken (Katona-apte, 1977). The negative value can relate to a food's supposed effect on health, morality or any other important aspect of individual or social life. Fasting, one kind of taboo, is found in Ethiopia at both the individual and group levels. In this example, it acts as a restriction on the time food is consumed, as well as the kinds of food consumed (Knutsson and Selinus, 1970). Extensive and nutritionally significant fasting is imposed by the Ethiopian Orthodox Church. While certain at-risk groups such as pregnant and lactating women, ill or weak individuals and very young children are traditionally exempted, food markets are tailored to fasting schedules; thus, only selected non-animal foods are easily available. Omololu (1971) has observed that these "fast days" coincide with times when food is scarce. Thus, a practice believed

to bring man closer to the Divine (Knutsson and Selinus, 1970) may also be an adaptation to a variable food supply.

Other negative food beliefs may not be linked with severe penalties, but may nevertheless directly affect food choice. For example, the traditional principles of "hot" versus "cold" and "weak" versus "strong" foods in Latin America (Cosminsky, 1975; Mazess, 1968) have guided food choice based on beliefs about the effects of certain foods on the body, which can be positive or negative. The principles also imply that the effect of one food can offset the effect of another on the body.

There are many reports in the literature of negative food beliefs for which historical or sociopolitical origins have been postulated. For example, pregnant and lactating women in some groups have been restricted in food intake because of health beliefs associated with their condition (Khanum and Umapathy, 1976; Grivetti, 1978; Bolton, 1972); however, it has also been suggested that the practices stem from the perception of these women as non-laborers and a drain on the food supply (Katona-apte, 1977). It has been hypothesized that much of the fish avoidance found in Africa stems from the pastoralists' scorn for farmers and other people who ate fish, rather than milk or meat for protein (Simoons, 1974). Pastoralists, by virtue of their

historically greater political and military influence, were thus able to spread the practice of fish avoidance.

Negative food beliefs can prevent access to some of the cheapest, most readily available and nutritious foods (Katona-apte, 1977). For example, the consumption of vegetables high in vitamin A is restricted among the Quechua-speaking people of the southern Peruvian highlands (Mazess, 1968) and the Malays of West Malaysia (Chen, 1972). However, food restrictions can also have unexpectedly positive nutritional effects. For example, Grivetti (1978) described the weaned child in the Tswana group of Botswana as having a greater diversity in food base than the adult, because small mammals, birds, etc. are believed "fit" only for consumption by children.

Though they may be deeply rooted, negative food beliefs can be subject to change. Cassel (1957) discovered that in a Zulu community in South Africa, egg consumption was considered a sign of greed and was believed to make girls licentious. Certain economic measures coupled with dietary instruction gradually changed these views and increased egg consumption. In another example, the Orang Asli in West Malaysia consume an enormous variety of jungle animals - taboos are associated with the consumption of some of those animals by certain groups, such as pregnant and lactating

women and children (Bolton, 1972). However, if a person consumes a meat and has no negative after effects, he can thereafter eat that meat.

Where negative food beliefs and values discourage the consumption of certain foods, there are many values associated with foods which encourage consumption. For example, eating patterns may be reinforced by association with memories or feelings of familiarity and security (Lowenberg, 1968). Prestige is a positive food value. Prestige is the status bestowed on an individual who conforms to certain standards of behavior a society believes are worth adopting; in the modern world, prestige is often associated with the acquisition of "visible symbols" such as housing, clothing, speech and food (Foster, 1973). In many societies today, prestige is an important food value associated with the acquisition of so-called "western" food habits.

While the movement towards acquiring prestigious foods or food habits perceived as typical of the higher social classes is positive in the fundamental sense that it is an inducement for change (de Chavez, 1972), the change that actually occurs may not be nutritionally beneficial. For example, the demand for prestigious foods has had a detrimental effect on the traditional diet in the South

pacific (Lambert, 1982) and among Japanese in Hawaii (Wenkam and Wolff, 1970). In addition, food habits associated with the desire for prestigious foods may create demands for products which are difficult or impossible to make or get locally (Pirie, 1972). Sometimes the effort to make prestigious foods "fit" into the individual or group lifestyle (eg, make them economical to use) results in the improper use of those foods. This problem was illustrated graphically in the infant formula controversy that is discussed further on. It is also important to remember that the staple food of a group of people enjoys its own high prestige (Lowenberg, 1968). This may have implications for the introduction of a new food if it is in competition with a nutritionally inadequate but familiar or prestigious food (Fathauer, 1960).

Two factors shaping food values which have been emphasized in the literature are "dietary individualism" (Jerome, 1976) and education. American "dietary individualism" may be one of the strongest influences "westernization" can have on developing countries. The expression of personal taste and the subordination of family to individual desires (eg, the catering of family meals to individual tastes) is a phenomenon which has been associated with change from the traditional Japanese diet to

cosmopolitan or Americanized diets documented among Japanese immigrant families in Hawaii by Wenkam and Wolff (1970). In the U.S., personal health is a strong factor influencing motivations to diet, and it appeared to increase with age in one group studied (Berman, 1975).

Education is a factor with great potential for affecting food values and thus changing - or sometimes reinforcing - food habits. It starts at the individual level and can exert an effect through all levels of society. The effects of nutrition education on dietary modification have been studied in a wide range of groups, from the poor (Al-lsi et al, 1975; de Chavez, 1972) to food faddists (Wilson and Lamb, 1968). But nutrition education must function within the framework of existing attitudes toward food (Sipple, 1971) or it will not be successful in motivating the individual to fully integrate the dietary change with his lifestyle, understanding and health concepts (Knutson and Newton, 1960). Towards this end, it is crucial to realize that a health educator will not usually be working in a "knowledge vacuum," but rather with nutrition concepts and food values that do not coincide with his own (Cassel, 1957).

The last concept listed under "compatibility" concerns how well a food change accommodates home technology; or

conversely, how well home technology may be adapted to a food change. Technological advances have great potential for changing food habits, and they can take effect at the national, regional, local and household levels of capacity to produce, prepare and serve food. Because of the complexity of the food picture in any society, technology must be discussed in the context of economics, food availability and customs and beliefs. For example, advancements in technology rely heavily upon factors such as availability of transportation, marketing structures, knowledge of preservation and food variety (Eppright, 1947). The steps necessary to successfully introduce an innovation such as a change in technology require a detailed knowledge of the culture, particularly of existing technology, in order to communicate characteristics of the innovation such as its meaning, use, function and other attributes (Graham, 1973). In assessing technological capacity, it is important to examine traditional methods of food procurement. Much of the existing technology, particularly for local crops, may be useful. For example, Mexicans for centuries prepared maize by lime-water/heat treatment which freed niacin; in parts of Bolivia, Peru and northern Chile, Indians used a combination of sun-drying and exposure to frost at night to preserve potatoes (Dupin, 1974). Food storage and

preparation at the household level is often a limiting factor in the introduction of new foods (Sai, 1960). The heat and humidity of tropical areas, the cost and ease of preparation and the already over-burdened work schedules of men and women may require special technological features of a new food, crop, packaging or preparation technique. Time-saving technology may be helpful in rural areas where women have so much work to do, conventional training courses or extra energy expenditure for tasks place added stress on the woman's work performance and may jeopardize family continuity (Eide et al, 1977 and Savane, 1981).

There are many examples in the literature of successful and unsuccessful trials of technological innovations. In the area of product development, WSB (Wheat Soy Blend), a pre-cooked product developed by Archer Daniels Midland Company, endured several set-backs in the Dominican Republic and Panama due to prohibitive shipment costs and insect-infested packages. However, WSB was accepted in Morocco after a baking specialist demonstrated its use in bread, a major food of the country, and in British Honduras and Ceylon, where it also was substituted in certain recipes in school feeding programs (Horan, 1972). DURYEA, a weaning food developed in Colombia by CPC International, Inc., was designed to be easily prepared and served in a bottle or as



a gruel, in accordance with existing infant feeding practice (Robinson and Weisz, 1972). This product also required careful quality control measures for raw materials which reduced insect and microbial damage and allowed cheaper packaging. It appears that the effort to make DURYEA a local product - in terms of ingredients, packaging materials and management - was successful.

One of the most widely publicized failures of a product to fit home-level technology and education is the case of infant formulas in many developing areas. The decline in breast-feeding in industrialized areas was precipitated by advances in modern dairying and food technology within the population's economic means, adequate running water, standards for sanitation and hygiene, and widespread education (PAG Secretariat, 1973). Many forces were at work encouraging bottle-feeding in developing areas: among these, the initiation of women as wage-earners, commercial advertising pressure and lack of emphasis on breast-feeding by health officials were prominent (Jelliffe, 1976). However, minimum home hygiene, inadequate funds for purchase of the formula and lack of knowledge about how to use the formula have led to diluted and/or contaminated bottle-feeding and early marasmus and diarrhea (Jelliffe, 1976). In addition, Jelliffe (1975) has pointed out the

hidden costs of bottle-feeding, such as increased health costs due to bottle-related problems.

### B. Affordability

Whether food is affordable or not lies in the perception of each consumer. That perception is formed on the basis of how each individual recognizes and uses his or her purchasing power. Purchasing power is defined here as the income, property, goods or services available in exchange for other goods or services, in this case food. Many studies have investigated the association of measures of purchasing power with nutritional status or diet. For example, increased income is associated with a more varied diet and a greater consumption of milk and pulses in urban Hyderabad (Thimmayamma et al, 1973). Greater dietary complexity is associated with education, higher occupational status, higher level of living and house typology in St. Vincent (Beaudry-Darisme et al, 1972). Among certain northern New York families, the child's intake is positively correlated with the mother's employment status (Sanjur and Scoma, 1971).

Income is one of the major kinds of purchasing power. Assessing income may be complicated - subsidiary occupations

and an extended family system can spread responsibilities and rewards beyond clearly defined work (Taha, 1979). Low-income households are nutritionally at-risk because of their particular situation. The following discussion examines some of the economic issues affecting food procurement in low-income households.

With reduced incomes, poor families have special food purchasing problems. For example, a greater proportion of total income is spent on food compared to higher income groups (Taha, 1979; Thimmayamma et al, 1973). In cases where other expenses such as rent are fixed, the food budget is often the adjustable factor when unexpected costs arise, and cheaper foods or lesser quantities of foods may temporarily have to support the family. Complicating this situation, foods protective against malnutrition tend to be expensive (Scrimshaw, 1964). In Ethiopia, the celebrations which occur after the church-imposed fasts are over quickly deplete stores of cereal and other foods and drive up prices; thus, the housewife who goes to the market with the usual amount of money to spend comes home with less (Knutsson and Selinus, 1970). In some households, money may run out entirely at the end of the month, causing drastic, albeit temporary, changes in food habits (Bode et al, 1974).

The high price of foods in many areas is a direct

result of food import dependency. Food price and supply can be manipulated to a large extent, even with government price controls, by firms overseas (McIntosh, 1975). Such firms prefer getting stocks from abroad, rather than from undependable suppliers in rural Third World areas (Dupin, 1974). A trend in the last decade or so has been for certain firms to develop nutritious foods for target populations using indigenous raw materials so as to reduce costs and engage local economies (Bauman, 1972; Robinson and Weisz, 1972; Caruso and Moore, 1976).

The nutritional impact of reduced purchasing power can be readily seen. In traditional societies, weaning is a time of maximal stress; the increasing cost and scarcity of food supplies plus infection make the two year old susceptible to a debilitating array of nutritional deficiencies (Jelliffe, 1976). In some cases, children may get their daily nutrient requirements from one or two meals late in the day, but sit in school hungry if no breakfast can be afforded and there is no school feeding program (Bode et al, 1974). The effects of reduced purchasing power are amplified when customary foods are scarce and alternatives are expensive, or when certain groups practice avoiding inexpensive foods for cultural reasons.

All these considerations point to the necessity of

examining how money or purchasing power is acquired and dispensed at the household level. With very low-income households, the capacity to make dietary changes may rest on income or other household resources, such as equipment. Even dietary instruction cannot be effective if the economic capacity for change is not present, as was demonstrated with infant diets in three Mexican communities (de Chavez, 1972). Two households having the same amount of money may purchase, prepare and eat food in significantly different ways depending on household ecology, beliefs and customs. To state it in another way, purchasing power and food resources only provide the "opportunity to eat well" - how that opportunity is used depends on value judgments and decisions made by certain members of each household (Owen et al, 1974).

Affordability is not only defined as income, but also as other factors which dictate the ability to procure food. For example, time and energy added to household or community food procurement may detract from other activities necessary to health and continuity, including the ability to earn money to support a family. Conversely, time taken away from food-gathering activities and channeled elsewhere may put the household at risk nutritionally, especially where there are a limited number of members assigned to food tasks.

Eide et al (1977) have pointed out that some African women's low attendance at clinics and apparent reluctance to carry out nutrition instruction may be a reflection of the limited time they have outside of their obligations as food producers, housekeepers, mothers and wives. Graham (1973) has also argued that time involved in introducing or demonstrating an innovation (eg, new farm machinery versus a new seed) is critical to its acceptance.

Closely associated with the time factor in food procurement is labor and its division within the household. The resources available to labor affect its productivity. For example, advances in food planting, harvesting, processing and preparation must be directed to the appropriate group. Much has been written about the special circumstances of women's labor in this regard. In Africa, women are almost always treated as customers, but are in fact producers as well and require access to resources (Eide et al, 1977). Development strategies need to assess the role of each member of the community in the traditional food production system and consider these members as resources affecting the nutritional lifestyle of that community.

A factor in food behavior that links affordability, availability and social issues is land ownership, or the access to land for the purposes of producing food or cash

crops. Land ownership has often been associated with better nutritional status of preschoolers (Grewal et al, 1973; Valverde et al, 1977; Aguilon et al, 1982). However, the issue of land use involves such considerations as land tenure and accessibility, technological capacity, multiple ownership and the presence or absence of cooperatives. In the Caribbean, small farm populations use traditional tools and labor in traditional ways, but in competition with products produced by more modern technologies and economic structures (Le Franc, 1981). Also, Caribbean farmers maximize their limited resources by combining farming with other income pursuits, so that their decisions on what crops to produce may have much more to do with uncertain land control, tenurial status and demands from other occupational concerns (livestock-rearing, off-farm jobs, etc.) than they do with soil quality or nutritional needs.

When the model is applied to the study of food habit change, affordability may include the concept of nutrient loss which may occur in a change of diet. An example is the well-publicized trend in many developing countries to purchase items such as white bread, sugar, soft drinks and liquor, which are high in status, but low in nutrients compared to the foods they replace. Nutrient loss may also result from the improper handling or preparation of

a new food.

### C. Competitiveness

The case of food habit change is a special one to which the food habit model may be applied. Specifically, potential for change is key to the success of the introduction of a new food or food-related innovation.

A new food or food-related innovation must necessarily compete with existing habits and customs in some way; for example, taste, appearance, use, convenience or cost. Pirie (1972) maintained that acceptance is a function of awareness and perceived advantage. Awareness involves advertising, which can include home visits by a rural health worker to introduce better hygiene (Wellin, 1955), village meetings where a county extension agent persuades local leaders to try a new corn hybrid (Apodaaca, 1952), encouragement by a physician for a mother to breastfeed rather than use infant formula (Lillig and Lackey, 1982) or the more sophisticated advertising slogans, displays and announcements used by industry to sell high protein products (Horan, 1972; Kracht, 1972; Malaspina, 1972; Caruso and Moore, 1976).

Whatever the approach, advertising tries either to appeal to consumer interest or need, or to create the



interest or need. A product must appear to offer a clear advantage over alternative choices. It was fairly easy, for example, to persuade some residents of a Peruvian town that boiling water removed elements dangerous to health, since some health concepts were already associated with boiled versus unboiled water (Wellin, 1955). However, adoption of the practice depended upon overcoming certain disadvantages regarding time and fuel availability and the belief that boiled water was only for sick people. An issue such as product appearance or quality can determine the success or failure of the introduction of a new food. For example, Malaspina (1972) reported that the Coca-Cola Export Corporation tried to introduce a soymilk-based beverage in Rio de Janeiro, but the high viscosity of the product and its nutritional advantage did not appeal to the adult male, blue collar workers to whom it was targeted. Similarly, a greater yield-producing hybrid corn seed was readily adopted by farmers in New Mexico; however, most abandoned the new seed after about three years despite increased yields, because the taste and texture of tortillas made from it were unacceptable (Apodaca, 1952). In attempting to make products compatible with food habits and taste, the product's appeal may be too successful, as in the case of Incaparina (Kracht, 1972). Brand awareness was high in both

Guatemala and Colombia; however, Incaparina was so close organoleptically to the staple food, ground corn, that the concept of "added nutrition" was not perceptible by the consumer. Moreover, more than half of the consumers turned out to be middle- and upper-income families, although the product was designed for the poor (Pirie, 1972).

The perceived advantage of one food over another may involve the relative emotional importance of each food to the consumer. A useful method of categorizing foods by frequency of consumption and emotional importance in the diet was originated by Passim and Bennett (1943) and has been applied by other investigators (Jerome, 1980; Pelot et al, 1981). This method is used to identify which foods in the diet are "core" items, that is, the staple, universally used and most emotionally important foods, versus "peripheral" items, or those which are recent, infrequently consumed dietary acquisitions with little or no emotion attached to them (Sanjur, 1982). Between these two extremes lies a third category, "secondary core," which is differentiated from "core" by being widespread in use rather than universally consumed. For example, Jerome (1980) identified groups of core foods differentiating breakfast, lunch and dinner, and "basic" from "weekend" meal patterns among southern-born women in a Milwaukee district. Such

core foods as meat, eggs, cereals and cereal products, butter, beverage and sweet condiments characterized breakfast, whereas core foods at dinner included meat, vegetables, dry legumes, cornbread, butter and a beverage. Most importantly, the definitions of "core," "secondary core" and "peripheral" imply that attempts to make changes in food consumption face increasing resistance progressing from peripheral to secondary core to core foods (Sanjur, 1982). Thus, the relative importance of a food to the diet gives predictive information about the relative ease of a food change.

There is not only competition between foods on the market, but also between family members for available food. Customs of intrafamily food distribution may limit the food choices of certain family members. In Africa and the Caribbean, for example, it is not unusual for the males in the household to be given first choice at mealtimes, especially where animal foods are concerned (Sai, 1960; Marchione, 1981).

#### D. Availability

Foods which become core or important items in the diet must have been available to the community over a sufficient

period of time. Availability (production and supply) of food is of primary consideration in determining the dietary pattern of any group. Factors such as soil, climate and level of economic and agricultural development limit local food production (Brozek, 1958) and affect what may be produced in exchange for food grown elsewhere. Man's ability - or inability - to produce food is an important factor which can influence dietary patterns. It has been suggested that food scarcity is responsible for the extended breast-feeding pattern among poor farming communities in the Tigre province of Ethiopia (Knutsson and Melbin, 1969) and one source of the problem of inadequate weaning foods in many areas (Brown, 1978).

The ability to produce food is influenced by a variety of factors. Labor and technical knowledge (such as irrigation, fertilization and animal husbandry skills), along with the economic means to use both, to a large extent determine the basic food supply. If resources, at any level, are not available to individuals capable of production, then production potential goes unrealized. To take one example, most African women comprise "60 - 80% of the labor force in African agriculture" (Eide et al, 1977). However, the resources available to improve food production, such as agriculture extension services and technical

innovations, are usually not directed towards women, partly because of their preoccupation with other household duties, and partly because of traditions which may prevent their access to resources such as technical training (Eide et al, 1977). Gurney (1975) stated that staple foods of the Caribbean, which provide the greatest amount of total energy in the diet, take up significant working time and land area. With scarce resources, competition between these crops used as food and other crops used for cash income also determines food availability.

The natural occurrence of a food or the proximity to a food source can influence food acceptability. For example, Cassel (1957) reported that a Zulu community in South Africa was accustomed to gathering wild greens from the forest and enjoyed eating them. However, soil erosion had decreased the natural supply of these greens. A gardening program was initiated which resulted a decade later in an almost 80% increase in the number of homes with gardens. Transportation can also increase proximity to food, at least for those close to the road or rail (Dupin, 1974). Proximity to the land itself can influence what crops a farmer grows depending on the time and labor involved (Le Franc, 1981).

A secondary factor influencing food availability is

food and resource distribution, which is different for each social setting and subject to sociocultural forces. There are frequently customs or rules about the distribution of food and labor at the community and household levels. These rules become of interest to the nutritionist if, for example, sex disparities in food distribution coincide with disparities in nutritional status (Carloni, 1981). In an example of how culture can dictate food availability, the trends in the U.S. for convenience and snack foods has led to the ability to eat out of a vending machine. The child, who in some other cultures is largely dependent on adults for food, is now a direct customer in the market by virtue of his access to an enormous variety of foods, as long as he has coins to spend (Lantis, 1962).

In most societies, factors affecting food availability at the household level include who in the household decides which foods are purchased, who purchases the food, who prepares the food and who controls the finances (Carloni, 1981). The individuals who control the food supply in this way, called "gatekeepers" by Lewin (1943), act according to individual and cultural values in "channeling" or regulating the supply of food to others in the household or community. The Ethiopian Orthodox Church which imposes fast schedules, the doctor or nurse who prescribes breast-feeding over

formula to the new mother and the local food shop owner who makes decisions about what products are stocked and how they are presented to local consumers can all be regarded as "gatekeepers" to the extent that they affect food availability by physical or psychological means. It may also be helpful to know what other roles these individuals play in the household or community since, as discussed previously, the available time and labor are divided between food-producing and other activities.

It is also important to examine how food gathering and preparation activities affect the availability of food nutrients. Dupin (1970) illustrated this with the example of how Mexicans for centuries prepared maize by a lime-water/heat treatment which releases niacin. This point also became a serious issue with the misuse of infant formulas, discussed previously. It soon becomes clear that "food availability" must mean that the food is available directly to the person or groups in need, with its nutritional value intact.

#### Current Hypotheses Regarding Food Habit Determinants

Once a food habit model has been constructed, the next step is to determine which model factors, weighted as to

relative importance, shape food habits in a given social setting. Various hypotheses have been presented in the literature about the universal predominance of certain factors. One, for example, proposes that ideological factors are the principle influences on food habits. Ideological factors are those which involve "the role of cultural beliefs" (Dewalt and Pelto, 1977). It has been argued that, since man's search for food has historically been associated with uncertainty and fear, he has developed beliefs, superstitions and practices which give him the feeling of some control over his food supply (Shifflett, 1976). In some cases, it does appear that beliefs may be stronger motivators of food habits than economic considerations. Classic examples are seen in religious practices such as the Hindu tradition of cow protection, the fasts imposed by Islam, the Eastern Orthodox Church and others, and the Jewish kosher diet (James, 1979).

By contrast, there are researchers who hypothesize that socioeconomic factors may be the major ones operating in many situations. Although the term "socioeconomic" has been somewhat ambiguously defined as dealing with "economic, political and structural features" (Dewalt and Pelto, 1977), published reports frequently use income, or some other measure of purchasing power, as a socioeconomic variable.



For example, despite the successful introduction of nutrition concepts in several poor communities in Mexico, some individuals were unable to easily change their diets because of their extremely poor economic condition (de Chavez, 1972). Lillig and Lackey (1982) found that, among mothers in a subtropical Mexican valley, the most common reason given for breast-feeding infants was that breast-feeding is the most inexpensive method. For poor families, the sheer cost of a new item can be prohibitive, especially if the family is expected to spend very limited funds on one family segment - eg., young children (Sai, 1960).

Despite some attempts to weight certain kinds of factors over others universally, economic and social-psychological determinants of food habits are often closely linked (Van Schaik, 1964; Devadas, 1970; McKenzie, 1974). For example, an individual facing a short-term financial crisis cuts back on food - but on the foods that aren't emotionally important to him (McKenzie, 1974). In the classic study by Cassel (1957), food habit change among the Zulu residents of a "reserve" was achieved by initiating a combination of economic and psychological motivations for change, depending on the food involved. For example, egg consumption was increased after families saw that they could

increase production to provide eggs for eating as well as to perpetuate chicken stocks, and after considerable education directed at overcoming certain taboos about eggs. The same community held very deep-seated customs regarding milk consumption. Only members of the kin group of the household head could use the milk produced by the household head's cattle. There were additional restrictions for girls past puberty. However, once powdered milk from outside the community became available, and it was stressed that the milk did not come from cows belonging to any Bantu, milk consumption increased to the extent that the demand for powdered milk from some families could not be met by any of the available stores. These kinds of influences on food habits, from feelings and beliefs to income, must be identified and tested for relative strength of association with dietary behavior without presupposing the universal domination of any one factor over another.

Another theme in food habit research is the affect of urban growth or urbanization on food habits. People who go to the cities try to eat "like the city-dweller" (Dupin, 1974). Families from the country may benefit from the increased variety of foods found in the city markets and exhibit more cosmopolitan diets; however, they may have poorer diets than they had in the village if their

purchasing power cannot provide a diet at least equal to the one they had when they could consume some of the crops they raised in the country. Walker (1962) reported that urbanization in South Africa has had numerous nutritional effects, from increased alcohol consumption to lower exposure to sunlight with urban clothing patterns and even decreased iron intake with the switch from traditional iron pots to enamel or aluminum cookware. The socioeconomic profile of urban versus rural families is usually examined for the context of food habit change. For example, Florencio (1980) contrasted urban households in Manila to rural households outside Manila and found that rural families were larger, spent more time in food preparation and exhibited a lower mean level of education, a lower mean per capita food expenditure per day, and a lower percent of employed mothers. Interestingly, although the mother's education positively affected dietary quality for both types of families, mother's employment status positively affected the rural family's and negatively affected the urban family's dietary quality. Chassy et al (1967) used food frequency data from an industrial community in Mexico to form a food scale. Higher steps in the scale - representing greater food complexity - correlated with "indices of growing urbanization," such as the educational level and

occupational history of the household head. Lambert (1982) reported that, in the South Pacific, urbanization has had numerous effects, including a decrease in birth intervals, increased bottle-feeding, food shortages due to low incomes in urban areas and reduced consumption of traditional, high-energy and nutritious foods. He reported that, throughout the South Pacific, products such as white bread and rice, canned fruits, cabbage, lettuce and canned fish have replaced their traditional counterparts in the diets of the islanders.

The addition of imported western foods to traditional diets has been regarded as a symptom of "westernization" (Pirie, 1972) or, in a broader sense, acculturation to one or more new styles of eating, and has occurred concomitantly, although not exclusively, with urbanization. In general, a change in dietary style may occur with any move to a new area or exposure to new foods. For example, Wenkam and Wolff (1970) characterized the dietary patterns of Japanese immigrants in Hawaii as "traditional," "Americanized" or "cosmopolitan" (combining Japanese, Hawaiian, Chinese and American foods). Unfortunately, in many cases, westernized diets have been associated with health problems such as increased incidences of obesity, heart disease and related illnesses among South Pacific

islanders (Lambert, 1982) and Japanese immigrants in Hawaii (Wenkam and Wolff, 1970). In an attempt to characterize this dietary change, Pelto et al (1982) found that "modern" and "traditional" food use among Finns are independent patterns, implying that the adoption of new foods does not necessarily mean the replacement of old ones. Further, in a study of a Central Mexican village, Sanjur et al (1970) found that, although an increasingly complex family diet was related to communication- and education-related activities, the infant's dietary complexity was not. Thus, the way in which different family or household segments react to modernizing influences and adopt new food habits may differ. This has profound nutritional implications and points out the importance of examining the cultural context of food habits.

#### Methodological Approaches to Food Habit Studies

Methodology performs two roles in food habit research: it is the key to operationalizing the concepts of a model (eg., the construction of a questionnaire to collect certain kinds of data) for the purposes of hypothesis-testing, and it is the means to identify factors that are associated with food habits (ie, by the statistical analyses best suited to

the testing of a given hypothesis). The first role, although not emphasized here, has been discussed in depth by Pelto (1981). Pelto stated that a variety of approaches in nutritional anthropology is necessary to facilitate the investigation of a wide range of theoretical and practical questions. In the gathering of data, she stressed a number of concerns: the necessity of rigorous measurement to accommodate complex statistical analyses; the linkage of household and community statistics to regional and national statistics; the role of the emic perspective in "giving quantitative expression to people's own views;" the problem of "real" versus reported behavior; the inclusion of food levels (meals and events, as well as items), cycles, schedules and histories, the effective chronological scope of the data and the "auto-cultural" aspect of current research, which is the recognition that nutritional anthropology has been a product of U.S. academia, with its inherent biases. All of the above factors help determine the validity, reliability and scope of the data.

Given an adequate data base, the major challenge is to select analyses which test associations of food behavior with sociocultural variables so that the evidence supporting a given hypothesis is as compelling as possible. Tests of association, using nonparametric and parametric statistics,

are used by most investigators. However, a variety of more sophisticated statistical methods are available not only to interrelate variables, but also to create additional variables from the original data. The following discussion reviews how some of these methods have been used in food habit research.

Multiple regression has been used to determine the contribution of a number of sociocultural (independent) variables to the variation of food behavior (dependent) variables. This contribution may also be interpreted as the predictive influence of a set of variables on another variable. For instance, McDowell and Hoorweg (1977) looked at socioeconomic variables at the household level which they thought would give a prediction of recovery of a child from malnutrition. Regression was used to identify which variables accounted for most of the variance in recovery, and the total variance in child recovery explained by the independent variables. In another example, Popkin (1981) was interested in investigating the discrepancy between community-level and regional or provincial-level variation in Filipino preschooler malnutrition. When he used regression analysis to test associations between community and household level socioeconomic data and malnutrition by Gomez standards, he found that nutritional need was

positively associated with households who consume less than 60% of their RDA of calories and negatively associated with wealthy households (wealth was measured by asset ownership). He also suggested that distribution (skewness) of wealth should be considered in future work.

Guttman scaling, a technique which cumulatively classifies individuals or groups according to an attribute (Hertzler and Owen, 1976), has been used to scale dietary data for correlation with sociocultural factors such as urbanization and modernization. Higher steps in a food scale are indicative of increased dietary complexity. For example, Chassy et al (1967) scaled food frequencies from a 24-hour recall and demonstrated that the scale correlated positively with indicators of urbanization - education of both the male and female household head and the occupational history of the male head of household. In addition, Sanjur et al (1970) showed that, although a family food scale was positively correlated with activities related to communication and education among residents of a central Mexican village, an infant food scale was not, implying that during the modernization process, families may be differentiated in some activities and not in others. Beaudry-Darisme et al (1972) found that food intakes of families on the Caribbean island of St. Vincent formed a



food scale, the higher steps of which were related to higher occupational status, higher level of living and more "modern" health practices. Scaling techniques have also been used to generate variables such as the "material style of life" index, a Guttman scale of material items reflecting accumulated cash expenditures by a household (Dewalt and Pelto, 1977).

Pelto et al (1981) used factor analysis, rather than scaling techniques, to study "modern" versus "traditional" food patterns in West Finland. Factor analysis of 24-hour recall data produced two constructs which seemed to describe "traditional" versus "modern" food use in that social context, implying that the patterns were independent. In a different application, Sims (1978a) used factor analysis to verify the construct validity of categories chosen to group food attitudes among lactating women.

Path analysis is a technique which tests the linear relationship between variables where certain variables may be intermittent to others. Sims (1978b) used path analysis to support her hypothesis that the attitudes of lactating women influence their nutrition knowledge which in turn influences their food behavior in a linear fashion. In a study of preschoolers and their families in New York, Caliendo et al (1976) ran multiple regressions on a set of

family and maternal variables plus the child's dietary quality, and determined that two variables were intermittent and dependent; "homemaker attitudes" and the child's "dietary diversity score" directly affected dietary quality, but at the same time were dependent on the mother's nutrition education.

Numerous studies have used statistical analyses to differentiate groups of individuals as to food attitudes, beliefs or use. In a study by Baird and Schutz (1976), women from four ethnic groups rated the appropriateness of 20 foods according to 25 selected attributes or uses. Factor analysis of the data showed clusters of related attitudes/uses and how ethnic groups were differentiated by their association with certain factors. Pigott (1979) used discriminate analysis to determine what group separations of some United Kingdom residents (using selected socioeconomic characteristics) produced the greatest differences in the subjects' preference ratings of 52 foods. In another study, Sims (1978a) factor analyzed responses by vegetarians and nonvegetarians to attitude, belief and value statements, then used discriminate analysis to determine which of the food-related value orientations (factors) best differentiated these two groups.

## Caribbean Food Habits and Nutritional Problems: An Overview

Food production and use in the Caribbean have been shaped by the various settlers in the islands: the native Carib and Arawak Indians, the Europeans and Africans of the colonial era and Orientals, including Chinese and Indians (Jerome, 1975). In addition, the cultural interchange between islanders and tourists, many from the U.S., Canada and Great Britain, has wrought an enormous change in food customs.

The following overview presents selected reports on these and other food-related sociocultural factors in the Caribbean, as well as nutritional data, with emphasis on Antigua, W. I.

### A. The Economic Impact of Colonialism in the Caribbean

The early Caribbean inhabitants, the Carib Indians, were subsistence food producers with a barter system of trade. European colonizers then introduced a market system and monetary exchange for goods as part of their plantation production systems and the islands became both sources of agricultural raw materials and markets for agricultural

inputs and food supplies from Europe (McIntosh, 1975).

In the aftermath of colonialism and other economic and political transformations, many Caribbean farmers have experienced limited access to land, capital, technology and management, and have had to operate in undeveloped marketing systems (McIntosh, 1975). Farmers can combine a number of food production techniques such as multiple cropping, livestock-rearing and off-farm jobs in a way that maximizes their limited resources without necessarily achieving subsistence production (Le Franc, 1981). Caribbean farmers are generally poor and don't consume everything they grow; therefore, prices of their essential foods should be kept low, while profits on crops need to be adequate (Gurney, 1975).

Food import dependency continues wherever local production cannot compete in quality or quantity with European goods. Raw imports are shipped from Europe to Caribbean storehouses and processed by Caribbean-located but European-owned processing firms. These firms may be in the islands primarily to hire local labor; however, local people are often excluded from top management (McIntosh, 1975).

#### B. The Caribbean Diet

The present-day West Indian diet is generally starch-based, with rice, root vegetables, corn and wheat products, and emphasizes the mixing, combining and spicing or flavoring of foods (Jerome, 1975). A variety of traditional vegetables, such as cassava, plaintain, eggplant, okra and dasheen may be stewed separately as a side dish or combined with meat or fish sauces. Tropical fruits are eaten frequently, but not as a structured part of any meal.

People in the Caribbean region also consume great quantities of imported fish products, including dried and salted, smoked, pickled and canned fish (Wessel-Dane, 1979). In the Caribbean, local inshore fleets and boats work from scattered beaches and production centers. Fish is landed in small quantities in scattered areas and marketed in small volumes by a large number of vendors (Vidaeus, 1971). For most vendors, there is an almost complete turnover of fish from day to day; therefore, the vendor doesn't need to preserve fish for more than a few hours. Ice and storage are used only if the fish is left over at the end of the day; the customer may then associate ice with poor quality fish.

### C. Nutrition and Health in the Caribbean

Miller (1983) has described the health situation in the Caribbean as a problem of "coping with increasing diseases of affluence as we continue to battle against diminishing diseases of poverty." The "diseases of affluence" include obesity, diabetes, hypertension and mental health problems, especially those which are alcohol-related (Ennever and Standard, 1975). However, problems stemming from poverty exist as well (Miller, 1983), and these include gastro-enteritis and malnutrition among children, and nutritional anemia among pregnant and lactating women and children (Ennever and Standard, 1975; Simmons and Gurney, 1982). Research efforts have especially been directed towards child feeding practices and health.

### 1. Feeding Practices and Health of Young Children in the Caribbean

It is current practice in the Caribbean to have mixed infant feeding: Cook (1971) reported that, in surveyed areas of Trinidad, Guyana, Montserrat and Antigua, the average child has been given a bottle by one month, but is not weaned from the breast until at least six months of age. Also, the introduction of herbal (bush) teas almost from birth, a common West African practice, continues in the present Afro-Caribbean population (Marchione, 1980).

Almroth and Latham (1982) reported the early use of bush tea, orange juice and water in infant diets in Jamaica; they also noted that one-third of the infants surveyed suffered from mild to moderate protein-energy malnutrition, with most of these children falling between 81 and 90% of the Harvard standard weight for age.

In the Caribbean, the weaning age child is often nutritionally at risk. Sinha (1979) reported that, in Guyana, St. Kitts, Nevis, St. Lucia, Barbados and Jamaica, as age increased from 6 months to four years, the percentage of infants below 80% of the Harvard standard for weight for age increased. Foods given to the weaning-age child often include low protein flours or starches such as plaintain (Sinha, 1979), arrowroot or diluted proprietary baby foods (Lees, 1964).

Greiner and Latham (1980) found that the nutritional status of 1-2 year olds was related to economic level, age of sevrage, child hospitalization and attendance at postnatal clinics, marital status of the mother and presence of the father in the home, among other factors. Although illegitimacy has been high in the Caribbean (Lees, 1964), Cook (1971) disputes the stereotype of the "butterfly" West Indian father by pointing out the fact that the majority of youngest children have their father in-residence in areas of

Trinidad, Guyana and Antigua. In fact, according to research done in St. Vincent, it appears that a father working away from home may earn better wages and thus provide a better diet for the young child in the family (Greiner and Latham, 1980). In a discussion of the various feeding situations found in the Caribbean, Morris (1971) remarked that a young father may only visit the baby and offer powdered milk to the mother as support; however, if the milk is not enough, money may be taken from that used to purchase food for other household members. Also, the "mother" may be a surrogate; for example, another relative. Sometimes foods with status are purchased for the child regardless of their nutritional value. Intrafamilial food distribution also affects diets. Marchione (1981) found in Jamaica that the sharing of animal products and fruits between the mealmaker and the one year old positively correlated with the child's nutritional status; however, the sharing of sweets and sugar negatively affected status.

#### D. Antigua

##### 1. Food Habits in Antigua

Antigua's dietary patterns reflect traditional agriculture and the influx of imported foods through



tourism. Sugar, molasses and cotton were once the mainstays of the agricultural sector (May and McLellan, 1973). However, they have been replaced by multi-cropping and production of Antigua pineapple. Fisheries and animal rearing, coupled with producer and consumer cooperatives, have been developed in order to ease the dependency on imports and the burden of high prices. Tonge (1979) has described the various food activities of the island: "...Many homes, urban and rural, have kitchen gardens - this is usually mixed crops of lettuce, carrots, parsley, sweet peppers, ... peas and beans, eddoes, sweet potatoes, cabbages, pumpkin, tomatoes, to name a few. At least one fruit tree can be seen growing in every backyard ... In Antigua, there is a thriving fishing industry - fish pots are made locally from a special type of vine that is very strong and also from the bamboo and imported wire used with local sticks for frame support ... All kinds of fish, including shell fish, can be seen in the fish market ... Any visit to a market, ... especially on an early Saturday morning, will show the dominance of Caribbean women in the marketing of produce from the land and sea ... They dress in colorful print and an apron that covers up the dress with large pockets on the inside of the apron ... They are characterized by their shrewd business acumen ... The women

usually assist their men in the rearing of their animals. Many rural families care for and tend their animals for home consumption and marketing - cows, sheep, goats, rabbits, guinea pigs (which seem to be dying out), poultry and pigs are some of the animals reared for meat and milk. There are numerous food shops - retail shops, wholesale and super markets ... Meals are planned and prepared mainly by women ... Nutrition Education is taught in the schools and in Adult Classes and Extension Services ... Advertisements of Modern Mass Media are somewhat controlled by foreign business. This is not helping our women with good patterns of eating for their families, as they prefer to give their babies S.M.A. and other commercially prepared foods which we know are second class to breast milk ...."

Antiguan agriculture is characterized by wet season gluts of produce that are not adequately stored or preserved locally, and expensive and limited dry season production due to the lack of irrigation technology and cost of water (Michael, 1981). The agriculture marketplace is set up to favor the middleman. This individual can purchase from a number of farmers and offer a greater supply of produce to the hotels; however, the farmer does not experience any benefit from the prices the hotels are willing to pay (Livingston, 1981). It has been calculated that the major

food spending by Antiguans is on cereal and cereal products, meat and dairy products and sugar and sugar products; thus, programs emphasizing vegetable products do not significantly reduce import dependence (McIntosh, 1978).

Little food preservation technology is practiced on the island. As of 1981, Antigua had one processing operation which produced bottled catsup, hot sauce, fruit nectars, onions, cucumbers and lime juice for island consumption only (Michael, 1981 - personal communication). Although the Central Marketing Corporation, which buys produce to sell at controlled prices, has a cold storage facility and coolers, a British project to furnish the fish market area with a market hall, ice plant and chill room was not completed as of early 1982 (Joseph, 1982).

Animal raised by the household can be of significant nutritional importance, especially to low-income families. Animal raising practices in Antigua have become so haphazard that grazing laws and regulations have evolved to prevent damage to crops and other property (Livingston, 1981). However, there is a great deal of political pressure against enforcing these laws (Livingston, 1981).

The Ministry of Education has given considerable attention to teaching Home Economics, including nutrition, in the government schools. A CARICOM (Caribbean Community)

workshop produced a syllabus for primary and secondary schools which Antiguan teachers were to test and review by March 1982 (Hurst, 1981). This syllabus included a discussion of factors which influence the use of traditional Caribbean foods, an introduction to new ways to prepare traditional foods, lectures on how the body uses food and instruction in good dietary practices and food preparation.

## 2. Health Problems in Antigua

The Caribbean Food and Nutrition Institute has surveyed the nutritional status of preschoolers in Antigua. Out of the approximate 4,000 preschoolers who attended Child Welfare Clinics in 1975, records for a random sample of about 13% were examined for weight for age (Gueri, 1975). Results showed that about 40% of the children weighed less than 90% of the Gomez standard at birth and were thus considered to be "malnourished at birth." Approximately 43% of all children under 5 years exhibited a weight for age less than 90% of the standard. A 1974 survey in St. Lucia (CFNI, 1982a) and a 1980 survey in St. Kitts-Nevis (CFNI, 1982b) found this degree of malnutrition in 43.6% and 42.4%, respectively, of children under 5 years. The 1975 Antigua data identified second or third degree malnutrition in 7.5% of the total sample, with a higher proportion in 2- and 3-

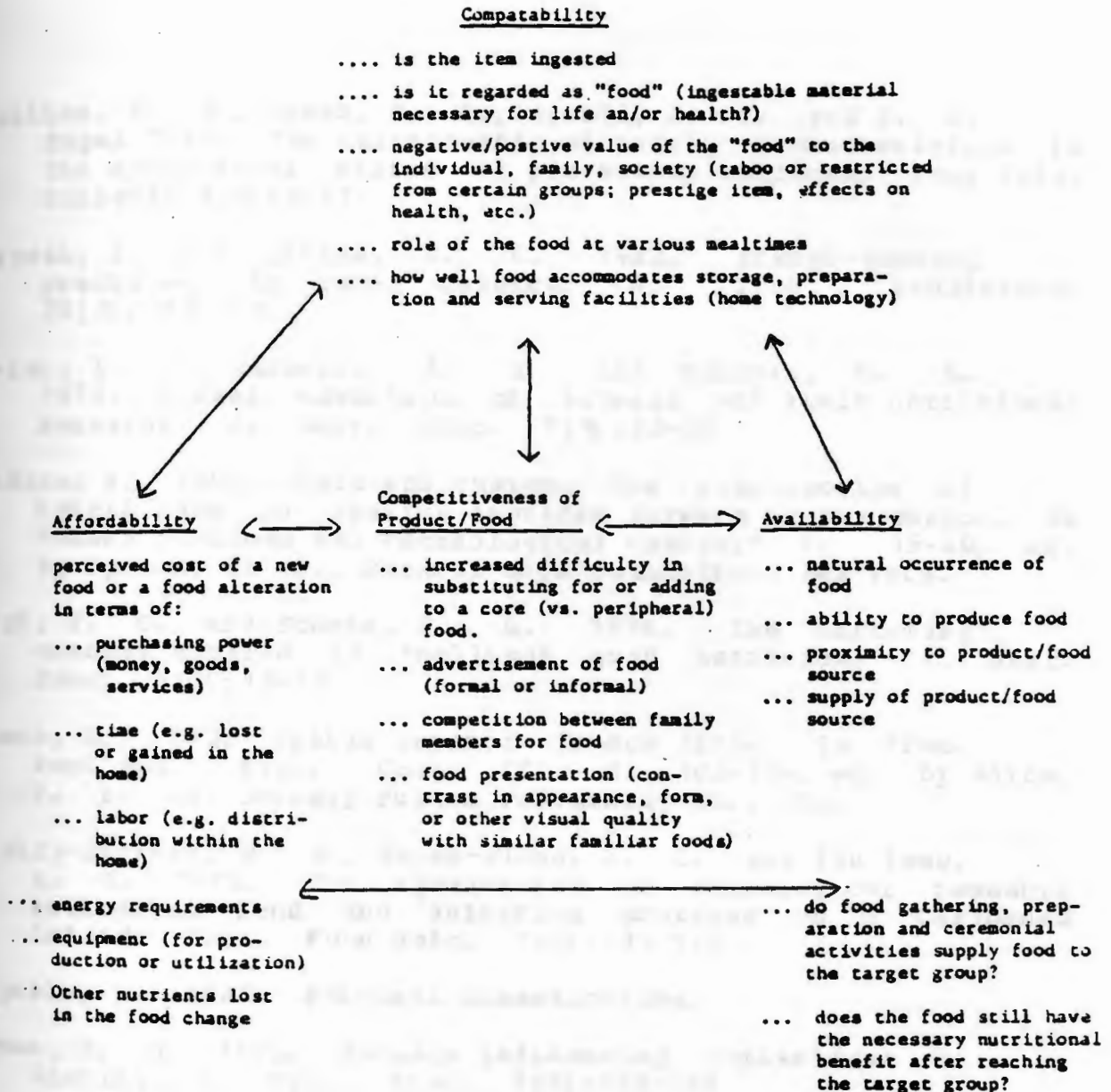
year olds. In addition, 20% of the children admitted to clinics 12 months prior to the study period suffered from either malnutrition or gastroenteritis, or both. The results of a CFNI survey of Antigua in late 1981 showed that 38.9% of all children under 5 years in the sample fell below 90% of the standard (CFNI, 1982c). While the 18-23 months age group exhibited the greatest proportion of underweight children (56.5% weighed less than 90% of the standard), there was no evidence of a subsequent decline in the nutritional status of older groups. In addition, it appears that underweight females tended to be younger than underweight males. Thus, there may be influences selectively affecting the status of preschoolers in Antigua by age and sex. Nutritional deficiencies among these vulnerable groups may include insufficient energy intake, protein deficiency associated with the reduced energy intake and iron deficiency anemia, all of which are typical of the area (McIntosh, 1978).

Little current information is available on adult health problems in Antigua. However, obesity and related conditions, possibly due to the consumption of "empty-calorie" imported foods (especially sweets) and a tendency to fry many foods, have been evident (DeJose, 1981). Iron deficiency anemia among pregnant and lactating women is a

problem in the region (McIntosh, 1978). Antigua has also been tentatively identified as a country where xerophthalmic areas have been reported (PAG Secretariat, 1976). Alcoholism has been the number one mental health problem in Antigua, where it is considered manly to drink and get drunk (Benjamin, 1981).



FIGURE 1: FOOD HABIT MODEL



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## Methodology

### I. Generation of the Food Habit Model

Food habit determinants discussed in a wide cross-section of anthropology, nutrition and food science literature were reviewed by a multi-disciplinary team and summarized into a food habit model shown in figure 1. This model was to be the guide for the study in Antigua.

### II. Choice of Study Site

Antigua, an island in the Eastern Caribbean, was chosen as the initial test site for the food habit model for the following reasons: first, with an area of 108 square miles and an English-speaking population of approximately 75,000, the main island of Antigua was appropriate in terms of logistics to be handled by a single investigator. Secondly, the island was relatively close to the University of Rhode Island, which reduced project costs. Further, URI faculty members had contact with a key Antiguan government official working in food, agriculture and women's affairs on the island. Most importantly, however, the island, with its dynamic interplay of tourism and traditional island

lifestyle, was an ideal location to study food habit change and the factors influencing change.

### III. Research Design

#### A. Choice of Study Population

Because of the objectives of the study and the character of the test site, it was decided that the study population should be one which furnished a contrast in lifestyle possibly leading to differences in food habits. Specifically, one test group was to be characterized by a more traditional or agricultural lifestyle and the second characterized by exposure to tourism in an urban setting. These two groups approximate a "before" and "after" sampling of a population which is hypothesized to be changing its food habits as a result of the exposure to tourism. Two parishes, or regional divisions on the island, were chosen for this purpose: St. Mary's, a rural area of fishermen and farmers, and St. John's, which consists of the capital city of St. John's, its port, oil refinery and other major business centers.

#### B. Participant Observer Stage

Approximately one-half of the time spent on the island

was devoted to participant observation. This was a time to study the cultural setting itself, establish contacts, garner ideas for the questionnaire and gather supporting information as a context in which to interpret later results of the survey. Some of these activities included meeting with government officials of the Women's Desk, the Ministry of Agriculture (including Agriculture Extension), the Ministry of Health, the Fisheries Department and the Ministry of Finance. Contacts were also made with numerous Peace Corps workers, the Meals for Millions representative, the Partners of the Americas committee for Antigua and others. There were many trips to farms and villages with agriculture and health workers, resulting in informal talks and contacts with local farmers and villagers. Informal interviews were held with vendors, store owners and other townspeople. Various foods were catalogued and priced in the food shops and markets of St. John's. Finally, all available statistical information on food imports and exports was obtained.

### C. Questionnaire Preparation

The data on food habits in Antigua and socioeconomic factors hypothesized to be significant in determining those food habits was collected by survey questionnaire. The

questionnaire collected data which was designed to allow tests of hypotheses about the effects of acculturation (exposure to and assimilation of a western lifestyle, in this case), economic or material factors and ideological factors upon food habits (see Table 1). Questions asked included information about the frequency of consumption of selected foods, household production of food, household composition, food preferences and avoidances, and opinions about food-related ideas or concepts. Also included with the questionnaire was a 24-hour recall. Opinions about the expense and availability of selected foods, as well as the perceived "importance" of certain ideas when shopping for or growing food, were obtained using an adaptation of the modified semantic differential test board (Dewalt and Peltó, 1977). This device provided a seven-point scale for ranking foods or ideas according to the desired criteria. One board for each interviewer was ordered from a carpenter in St. John's.

A preliminary draft of the questionnaire was reviewed by faculty members in Anthropology and Nutrition and Food Science at the University of Rhode Island. After revision, the questionnaire was critiqued in Antigua by the Principle Nursing Officer, the Director of the Women's Desk, a Community Development worker and nursing assistant, the

Superintendent of Home Economics for the government schools, the Meals for Millions representative in Antigua and a Peace Corps agronomist, among others. During this period, questions were revised where necessary to assess the food patterns associated with typically Antiguan foods, and to collect certain socioeconomic information. Phrasing of questions was also reviewed. The questionnaire was typed and copied locally and pre-tested in several local households for final changes and to allow timing of the interview. The interview generally took 20 to 40 minutes to complete.

A second, shorter food frequency questionnaire was designed for use with a subsample drawn from each zone sample. This questionnaire listed a number of foods not included in the major questionnaire with space for recording how often each food was eaten and which individuals in the household were consuming the food (see Table 2).

#### D. Interviewer Selection and Training

As a result of inquiries made by officials in agriculture and health services, seven Antiguan women were contacted who were willing to help conduct interviews in the two survey areas. Two were student teachers at a city secondary school, one a Community Development worker, one a

nursing assistant in a village health center and three were members of their local Community Development or Community Health committees. Each agreed to two half-day training sessions and a two-week trial period of actual interviewing, for which they were paid.

During the half-day training sessions, all the interviewers met with the leader as a group. The questionnaire was read through by everyone and discussed. Each interviewer practiced giving the interview to another person. Instruction sheets were handed out to guide interviewers in dealing with potential problems such as the refusal of an individual to be interviewed or no one at home in a chosen household, and to assist in keeping tallies of each survey zone, the number of houses approached and the result (interview or no interview completed). Questionnaires, test boards, pencils, sharpeners and erasers were handed out. The sampling method was described and the first field assignments were scheduled.

The interviewers were divided into teams: the four women from St. John's were assigned to survey the city, and the three from Urlings and Old Road Villages were assigned to survey these and the remaining villages in St. Mary's Parish. Interviewers were first assigned to their immediate neighborhoods in order to foster self-confidence and

familiarity with the work in a familiar environment. Instructions on survey procedure, including number of houses to be sampled and a brief trip to identify each new survey division, were given on a daily basis - sometimes the morning of the particular survey day, sometimes the evening before. At the end of each work day, the leader met with each group at a pre-arranged spot in the city or country to review all questionnaires for blank or vague responses and to give payment, if scheduled. After about the first half of the survey period, such meetings were often scheduled every other day, as interviewers became practiced and familiar with the overall procedure.

#### E. Sampling Procedure

Survey divisions were based on Caribbean Food and Nutrition Institute field notes describing boundaries used by the CFNI during its 1981 Food and Nutrition Survey (CFNI, 1981a). All survey boundaries were carefully checked out and revised by the field leader in cases where descriptions were vague or boundary lines inappropriate.

For each survey division (sub-division of a city zone or an entire village), the starting point was determined by blindly choosing a piece of paper marked "northwest," "northeast," "southwest," or "southeast" in reference to the



four corners of the zone (in the city, this usually turned out to be the corner of a city block - in the villages, it was necessarily the outermost buildings for a given village geography). Beginning at this point, the interviewers, having randomly selected a number from a table of random numbers, counted buildings along the boundaries from the perimeter inwards, in a clockwise direction, until they had counted up to the random number. They then sampled a cluster of houses (one person per household) of a number dictated by the estimates of household numbers provided by the Caribbean Food and Nutrition Institute (CFNI, 1981b). In the villages, the interviewers would begin at the designated spot, count the appropriate number of buildings and then sample two houses in a cluster. They continued this procedure, beginning with the next house, until the entire sample had been made. In both the city and the country, roads, tracks and footpaths could be used as guides for counting. The procedure for counting was in this sense arbitrary as long as all buildings in an area were counted with no repeats.

Interviewers were instructed to ask for the "lady of the house," or, if no older women were present, any adult member of the household. Prior to giving the questionnaire, they explained the general nature and objectives of the

study, assuring the respondent that none of the information was to be used for tax purposes.

After every interview, the interviewer asked the respondent if he or she would be willing to complete a second, much shorter interview at a later date. If the respondent was willing, an appointment was made, and the same interviewer returned on that date to fill out the subsample questionnaire described previously. A total of 29 respondents granted these extra interviews.

#### IV. Data Analysis

The data analysis consisted of three stages: a descriptive report of the sample, including respondent, household members, house typology and food behavior; the calculation of variables to be used in subsequent analyses and a stepwise multiple linear regression to explore which socioeconomic variables were predicting a linear response in the dependent variable (Dietary Adequacy Score).

In the first section, the sample description included frequencies of selected characteristics of the respondent, the chief wage earner, the person who prepares the household's food and other household members, house typology, food supply and food consumption. The food

consumption report included two kinds of pattern analyses of the 24-hour recall data: factor analysis and meal pattern analysis. For the factor analysis, an individual's intake was recorded as the number of items present (coded as "1") in the entire 24-hour period out of the sample's total array of 164 foods. Each food item was coded once per individual regardless of the number of times it was listed in that individual's recall. Foods listed less than 2% of the time were excluded, leaving 77 of the original 164 foods. A principle components factor analysis was then computed using Varimax rotation and an eigenvalue cutoff of 2. The meal pattern analysis used individual food consumption data that was divided into three time periods: am (up until 12 noon), afternoon (12 to 4 pm) and evening (4 pm to midnight). Foods were categorized into 12 different groups, ranging from meats to beverages. Within each time period, each different food category found in the individual's diet was noted, in the form of one or more foods from a given category. For example, the "am pattern" for an individual might be meat + starch + milk. Frequencies of all such patterns that resulted were tallied for each time period.

A number of variables were calculated from the raw data for use in subsequent analyses. For example, twenty selected household items were marked present or absent in

each house where an interview took place. A principal components factor analysis was performed on the data using Varimax rotation and an eigenvalue cutoff of 1. Two factors emerged, one showing a cluster of modern appliances and recreational items that were considered to be basic acquisitions ("Basic") and one showing a cluster of luxury items that would be associated with a higher income household ("Luxury"). Other socioeconomic variables included food resources scores. Crops raised by respondents' households were placed into 7 categories that were chosen to reflect nutritional differences between crops: 1) starchy roots and tubers, 2) fruit and fruit trees, 3) green vegetables, 4) yellow vegetables, 5) miscellaneous vegetables, 6) peas or beans (legumes) and 7) sugarcane. If a respondent's household produced at least one crop listed in a particular crop category, the respondent received a point. A maximum of 7 points were given if the household produced at least one crop from every category. This score was named "Crop frequency." An "Animal frequency" score was calculated by adding up the different animal products raised for household consumption: cattle for meat, cattle for milk, chickens for meat, chickens for eggs, pigs or hogs, goats and sheep. The maximum score was 7. The sum of the "Crop frequency" and

"Animal frequency" scores for an individual was the individual's "Food Resources Score," which had a maximum of 14. Also calculated were two measures of food consumption, the Dietary Complexity and Dietary Adequacy Scores. Dietary Complexity was calculated as the sum of all the foods consumed by a given individual during the 24-hour period and ranged from 0 to 18. An individual's score may reflect a food or foods eaten more than once during the 24-hour period. To calculate Dietary Adequacy, food items from the recalls were coded "present" (1) or "absent" (blank) so that any individual's intake was identified as those foods or dishes marked "present" in his or her diet out of the total 164 foods listed by all respondents. All foods listed in the recall data were then placed in one or more of the following six food categories according to the nutrient composition of each food (CFNI, 1974): Protein foods, Dairy (calcium) foods, Starches, Vitamin A-containing foods, Vitamin C-containing foods and Other fruits and vegetables. Because 11 of the 164 foods were coded as non-specific vegetable dishes (eg, "fish and vegetables"), raw data was consulted in order to determine the specific vegetable content of these dishes on a case by case basis. In addition, potential nutrient sources such as sweet pepper and tomato paste, although used as seasonings, were placed

under the appropriate categories and the results interpreted cautiously. The Dietary Adequacy (DA) Score was then computed as the number of different nutrient categories present in an individual's diet and ranged from 0 to 6.

In the third stage of analysis, the interdependence of selected variables was examined via measures of association such as chi-square and the correlation coefficient (Kendall's tau b and Pearson's r). These tests were used both in descriptive analysis and in the preliminary screening of independent variables to be used in a multiple linear regression of Dietary Adequacy on selected socioeconomic variables.

In the first step of the multiple linear regression analysis, a correlation matrix (Kendall's tau b) was generated which included the Dietary Adequacy and Complexity Scores and socioeconomic variables hypothesized to correlate with Dietary Adequacy. Variables with statistically significant ( $p < .05$ ) coefficients with the dependent variable (Dietary Adequacy) were identified. Because of the greater magnitude and significance of the coefficients between many of the independent variables in comparison to the coefficients between independent and dependent variables (multicollinearity), a factor analysis was performed on the set of selected independent variables. Principle components

extraction, orthogonal rotation and an eigenvalue cutoff of 1 were used. The resulting theoretical constructs, as independent variables, were readily interpretable and had the desirable property of zero correlation with each other. These factors were then entered in a stepwise multiple linear regression analysis (probability F-to-enter = .05, F-to-remove = .10, tolerance = .01) with the Dietary Adequacy Score as the dependent variable.

TABLE 1: FOOD HABIT SURVEY QUESTIONNAIRE

page 1

Date \_\_\_\_\_ Zone (St. John's)  
 Name \_\_\_\_\_ or Village \_\_\_\_\_  
 Address \_\_\_\_\_ Interview Number \_\_\_\_\_  
 Interviewer \_\_\_\_\_

1. Who lives in this household? How are they related to you? What is the age of each person in your household? How many years of school has each had? What job does the chief wage earner hold and where does he or she work?

Member (relationship to informant)	Age	Years of formal <u>education</u> Primary/ College/ Secondary University	work (chief <u>wage earner only</u> ) Occupation	Where
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

2. Do you grow food crops in a  
backyard garden

ground

other

3. What food crops do you grow including fruit trees? What proportion is eaten by the household?

	<u>Proportion consumed</u>			
	one fourth	one half	three fourths	all
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____



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Proportion consumed

	one	one	three	
Zero	fourth	half	fourths	all

4. Do you buy any vegetables during the growing season?

Yes                      No

If yes, do you buy:      Fresh      Frozen      Canned

5. Do you buy any vegetables out of season?

Yes                      No

If yes, do you buy:      Fresh      Frozen      Canned

6. Do you raise any animals for the household to eat?

cattle: milk	chicken: meat
meat	eggs

pigs (hogs)	rabbits
-------------	---------

goats	sheep
-------	-------

7. Do you sell, exchange or give away animals you have?      Do  
you sell, exchange or give away garden produce you have?

Animals:

sell

exchange

give away

No

Garden Produce:

sell

exchange

give away

No

8. If you had more money to spend on food ONLY, what foods would you buy (specifically)?

a. \_\_\_\_\_ Why? \_\_\_\_\_  
 b. \_\_\_\_\_  
 c. \_\_\_\_\_  
 d. \_\_\_\_\_  
 e. \_\_\_\_\_

9. Who in this household prepares the food?

respondent                      mother-in-law  
 husband                        father-in-law  
 wife                             other women in the house  
 father                         older child  
 mother                         other (specify) \_\_\_\_\_

10. Has this person who prepares the food ever had any formal nutrition education or instruction in food?

radio                              village demonstrations  
 TV                                 school  
 adult education classes    other \_\_\_\_\_                      No

11. Who usually decides what foods are purchased?

respondent                      mother-in-law  
 husband                        father-in-law  
 wife                             other women in the house  
 father                         older child  
 mother                         other (specify) \_\_\_\_\_

12. Who usually purchases the household's food?

respondent                      mother-in-law  
 husband                        father-in-law  
 wife                             other women in the house  
 father                         older child  
 mother                         other (specify) \_\_\_\_\_

13. On the average, how often is food purchased?

every day  
 4 - 6 times a week  
 1 - 3 times a week  
 other (specify) \_\_\_\_\_

14. Where is food purchased?

local shop  
 market (St. John's)  
 supermarket (eg, Bryson's, Dews)  
 other (specify) \_\_\_\_\_

15. Are there any foods that individuals in your household avoid or don't eat for some reason, for example religious beliefs? Are there any foods avoided for health reasons, or out of customs?

	<u>Food</u>	<u>When</u>	<u>Avoidance</u>	<u>Why</u>
a.	_____	_____	_____	_____
b.	_____	_____	_____	_____
c.	_____	_____	_____	_____
d.	_____	_____	_____	_____
e.	_____	_____	_____	_____

16. I'd like to ask you a series of questions about your house:

a. Do you own your own house or rent?

own                      rent

b. How many total rooms are in the house, including living room, etc.? \_\_\_\_\_

c. From the following list of items, could you tell me which ones you have in your house at this time?

air conditioner	sewing machine
electric fan	telephone
TV: black & white	electric iron
color	coal pot iron or goose
radio	stereo
stove: electric	flush toilet
gas	pit latrine or tub latrine
wood	refrigerator
coal (pot)	washing machine (electric)
kerosene	clothes dryer (electric)

d. Does anyone in your household have a vehicle such as a car or truck?

car

bike

truck

yes

e. What is the water supply for this house?

running water or pipe in the yard  
 government or standard pipe  
 rainwater in cistern, tanks or drums  
 other \_\_\_\_\_

17. In the last year, have you or anyone in your household traveled overseas?

yes

If yes, where? \_\_\_\_\_

No

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18. How often do you read any of the magazines or newspapers? Which do you read?

Often \_\_\_\_\_

Sometimes \_\_\_\_\_

Not at all \_\_\_\_\_

19. Do you have any relatives who live overseas?

Yes If yes, how often do you communicate with them?

No often sometimes not at all

20. Do you have any friends from overseas who live here or who you correspond with?

Yes No

21. Do you listen to the news on the radio? Yes No

On TV? Yes No

22. Do you prefer local or international news?

Local International Both

23. Do you like to try new foods or dishes? Yes No

24. How often do you eat the following foods? Would you eat these foods more often than you do at present, if you could?

<u>Fish type</u>	<u>How often eaten</u>	<u>Would eat more often</u>	
fresh fish		yes	no
frozen fish		yes	no
canned fish		yes	no

<u>Fish type</u>	<u>How often eaten</u>	<u>Would eat more often</u>	
imported salt fish		yes	no
smoked or red herring		yes	no
pickled mackerel or shad		yes	no

25. Do you or a household member catch your own fish?

Yes No

26. How often does your household eat the following foods? If you could get more dark green leafy vegetables, would you eat more, the same or less of these foods?

	<u>How often eaten</u>	<u>Would eat</u>		
		<u>more</u>	<u>the same</u>	<u>less</u>
dark green leafy vegetables (spinach, eddo tops, etc.)				
ground provisions (sweet potato, white potato, etc.)				
canned vegetables				
fresh fruits				



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28. How would you best describe the following foods in terms of:

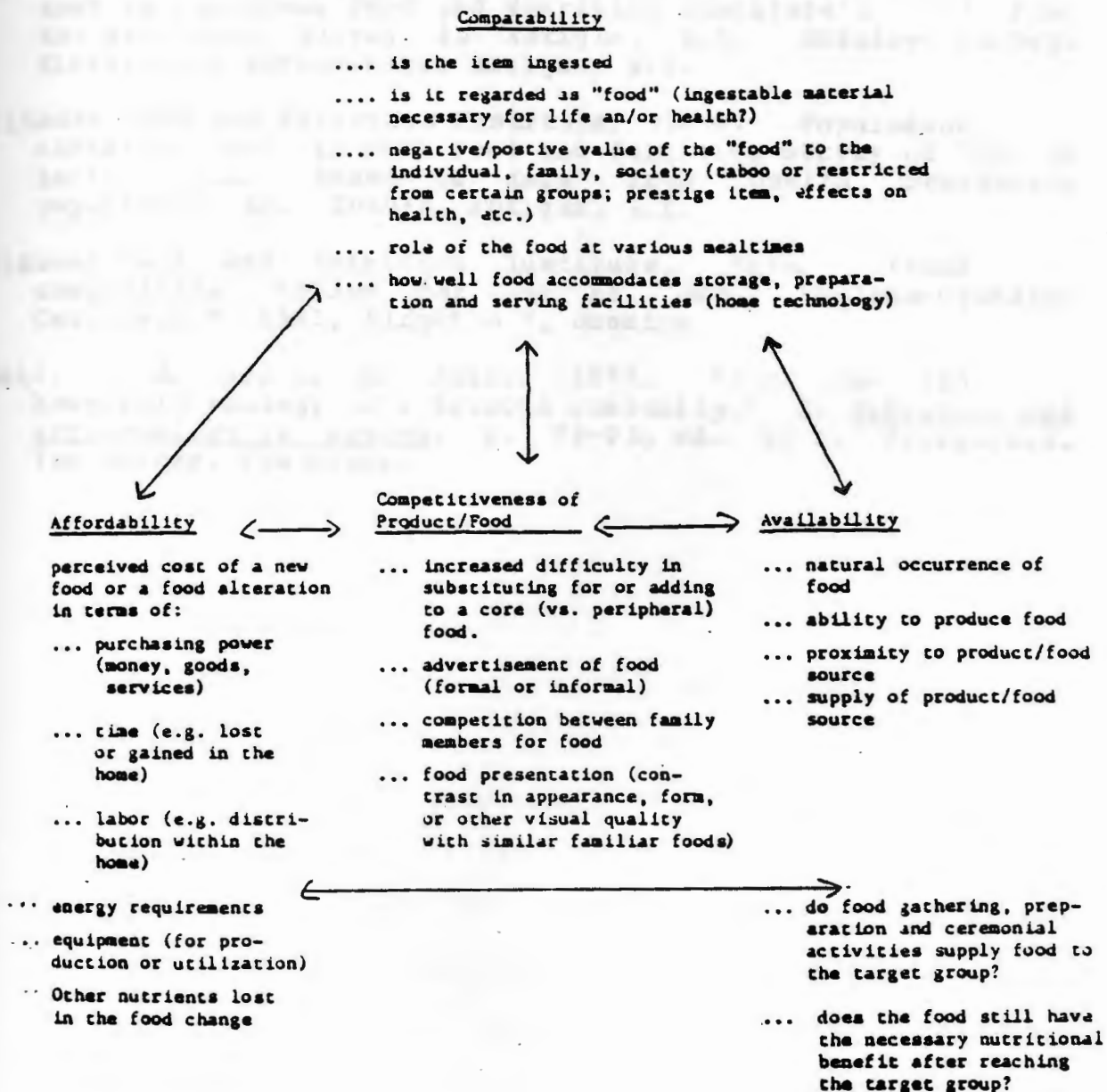
		1	2	3	4	5	6	7	
1. canned fish	inexpensive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	very expensive
	can get it when I want	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	can't get it at all
2. fresh fish	inexpensive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	very expensive
	can get it when I want	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	can't get it at all
3. imported salt fish	inexpensive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	very expensive
	can get it when I want	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	can't get it at all
4. fresh vegs	inexpensive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	very expensive
	can get it when I want	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	can't get it at all
5. canned vegs	inexpensive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	very expensive
	can get it when I want	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	can't get it at all
6. milk	inexpensive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	very expensive
	can get it when I want	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	can't get it at all







FIGURE 1: FOOD HABIT MODEL



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## Results and Discussion

Data results are presented and discussed in the following order: sample description (socioeconomic profile of the respondent and other household members), respondent's residence (including measures of household wealth), food consumption (food frequency and 24-hour recall data) and food beliefs and perceptions.

### A. Sample Description

#### 1. Respondent

Selected characteristics of the respondents are presented in Tables 1 - 4. Of the 305 respondents, 76% were female. Respondents' ages ranged from 13 to 96 years, with an average of 39 years. The ratio of females to males interviewed was highest for the 21 - 35 year old age group. The average level of education attained was primary grades completed, or 11 years of school (similar to junior high school completed in the U.S.). About 22% of the respondents had completed a high school level education (secondary grades completed) and 5% had begun or completed college.

When respondents identified all other members of the household in relation to themselves, about 43% of the respondents were identified as the mother in the household (Table 3). Of those respondents living alone, 85% were self-supporting (Table 4). Slightly more than one-third of the respondents were also the chief wage earners in the household (Table 7).

## 2. Chief Wage Earner

Selected characteristics of the chief wage earners in all households are presented in Tables 5 - 10. About one-third were between the ages of 35 and 60 (Table 5). Approximately 63% were male. The average level of education attained by all chief wage earners was primary completed and there was no apparent difference between male and female wage earners (Table 6). Of the chief wage earners who were not respondents, most were husband, father, boyfriend, mother, brother or son to the respondent (Table 7). Thirty percent of the chief wage earners held low-income positions such as a street cleaner, fisherman, farmer or domestic (Table 8). In 36% of the households, the chief wage earner held a medium-income position such as a machine operator, taxi driver, artisan or office worker, 20% held a "white collar" position such as a teacher, manager, officer or bank

clerk, and 3% held a professional (top income, maximum education) position such as a nurse, technician or businessman. In 10% of the cases, the chief wage earner's occupation was unknown. Out of all cases with complete data, proportionally more men than women held medium-income, white collar and professional level jobs. There was a strong correlation between occupational level of the chief wage earner and his or her degree of education (Table 9). Although 85% of the chief wage earners were living at home (Table 10), there was some intervillage variation. For example, one out of three chief wage earners in Bolans Village was living away from home at the time of the survey.

### 3. Household Members

Household composition data is presented in Tables 11 and 12. In 39% of the households, there were three or fewer individuals (Table 11). Thirty-nine percent had four to six people, 18% had seven to nine people and 4% of the households had ten or eleven members. The average number of household members was five. The majority (78%) of large households (seven or more members) were located in the villages.

In many cases, the respondent stated that he or she was the person who decided which foods to buy (56%) and who

purchased (51%) and prepared (53%) the food (Table 12). Aside from this individual, a variety of household members of both sexes seemed to be participating in these food activities; however, the mother, an older child or the wife of the respondent appeared to be important individuals handling food.

Approximately 41% of the respondents indicated that the person in their household who prepares the food had received some kind of nutrition education or food instruction through school (78%), TV (18%), radio (18%), adult education (7%) or nursing (one individual), with some receiving instruction from more than one source (Table 13).

#### 4. Respondent's Residence

##### a. House size and ownership

As indicated in Table 14, about 78% of the houses where interviews took place were owned by an individual associated with the household. Larger houses, (nine or more rooms) were all owned. About one-fourth of the houses had three rooms or less, 56% had four to six rooms and 55% had seven to fourteen rooms. The average size was four to five rooms.

##### b. Household wealth

To provide a measure of the degree of material wealth in the household, twenty selected household items were



marked present or absent in each house where an interview took place. These responses were factor analyzed, producing 6 factors. The first two factors, accounting for most of the variance, were named "Basic" and "Luxury" by the investigator (Table 15) and used as indicators of wealth and social status. Items loading significantly on the factor "Basic" include a black and white TV, radio, gas stove, electric iron, stereo, toilet and refrigerator. These items were interpreted as the first or "basic" possessions a household would acquire with income beyond what is necessary to cover essentials. Significantly, these include modern appliances in addition to recreational items. However, the priority given to the acquisition of one item over another is not necessarily predictable. For example, the investigator visited a two-room wooden house on the waterfront of St. John's which had a refrigerator and stereo; however, the house had only an outdoor privy. It may be that a small status or luxury item such as a radio is easier to obtain than indoor plumbing, which probably requires a greater investment and/or access to labor and equipment. Also, social pressure to acquire household amenities may not be as strong as peer pressure to acquire other status items. Refrigerators were found in 63% of the houses sampled (Table 16); however, it was not ascertained

to what degree Antiguan having refrigerators use them for the preservation of perishable foods, or whether the refrigerators include a freezer compartment. For cooking, gas stoves and the traditional coalpot appear to be widely used (Table 16), with almost half (150) the households using both. This is in contrast to a survey performed in selected Antiguan districts in 1969 (Cook, 1971) in which about half of the 167 homes examined were using kerosene stoves, 30% were using wood fires or a coalpot and about 18% were using gas. It appears from this survey that the gas stove is the major cooking appliance that has replaced the coalpot.

The second factor is composed of "luxury" items in the sense that, with the possible exception of the sewing machine, they could provide an extra or secondary degree of convenience or comfort. This factor includes a fan, color TV, sewing machine, phone and electric washer and dryer. Owning a fan or a clothes dryer on a sunny, windy island where most people, no matter where they live, can dry clothes quickly on a line, appears to be an "extra." According to one informant, phone installation is costly, and some Antiguan have had to remain on a waiting list for about two years in order to receive one. The sewing machine, albeit a considerable investment, can also represent a source of income for a tailor or seamstress.

The investigator informally interviewed vendors on the streets of St. John's who claimed to use their own machines to make the dresses they sold, and at least one respondent used a sewing machine to sell clothing to support her family.

Vehicle ownership is another factor which appeared to differentiate households (Table 16). Only 20% of the households sampled had a car. Few households (10%) had a bicycle and only 9 households had a truck or bus.

#### c. Household Water Supply

The type of water supply available to a house can be important on an island that experiences a dry season and where backyard agriculture figures prominently. Most of the domestic water supply in Antigua originates from a dam located in the south-eastern part of the island. A household may be able to use more than one kind of access to this water. The government or standard pipe was used by a majority of respondents (59%) and was usually located along a street where it served a number of houses (Table 17). About 39% of the households sampled had running water in the house, or a standard pipe in their own yard. Rainwater collected in cisterns, tanks or drums was used by about 42% of the respondents. For the majority of respondents using rainwater, it served as a supplement to water from a

standard pipe or a private access to the water line. Very few people (5) in the sample used both a private source (running water or pipe in the yard) and a standard pipe.

There was no obvious trend for one kind of water source in the city versus the villages (Table 18); however, in one village, Bendals, all respondents reported using only the standard pipe. Also, there appeared to be a greater percentage of respondents using rainwater in the villages, except for Bendals and Bolans, compared to the city.

#### 5. Cosmopolitanism of Respondent and Household Members

Exposure of the individual, family or community to outside influences has great potential for changing food habits. In the Caribbean, migration has become institutionalized (Patterson, 1975) and tourism has brought outsiders and their customs to many of the islands. Greater exposure to outside ideas and customs is presumed to result in more "cosmopolitan" diets, or diets that borrow from many cultural patterns of eating (Wenkam and Wolff, 1970). In the same way, exposure to imported foods offers potential for increased dietary variety.

Measures of exposure to outside ideas, termed cosmopolitanism in this study, hypothesized to be meaningful in the Antigua setting are presented in Table 19. In 45% of

the cases, either the respondent or a member of the respondent's household had traveled to the Eastern Caribbean, the greater Caribbean area, the US/Canada or Europe. Of these travelers, 61% did not travel farther than the Eastern Caribbean. About 35% traveled as far as the US, Canada or Europe. Most (86%) respondents also had relatives overseas with whom they at least sometimes communicated. About 40% of the respondents claimed to have friends from overseas. These results imply that many Antiguan are potentially exposed to new ideas through interpersonal communication. While the overwhelming majority (77%) of respondents preferred both local and international news, only 49% were reading newspapers, and of these, 79% were actually reading only local-level papers. The cost and availability of regional and international papers may influence the extent of readership. In addition, some local and international news is reported daily on radio and television. In summary, extent of household travel, having friends from overseas and reading the regional and international papers are variables measuring cosmopolitanism which appear to differentiate respondents and which may be tested for association with food behavior variables.

#### B. Food Supply

### 1. Frequency and Location of Food Purchase

Three-fourths of the respondents said that in their household food is purchased one to three times a week (Table 20). About 17% reported that shopping was performed daily. Table 21 shows that greater proportions of households shop daily if they are not producing their own milk, fish or eggs. However, crop producers tended to do more daily shopping. Also, roughly half of the respondents' households that shopped at least four times a week had refrigerators (Table 22); thus, factors other than food preservation capability were influencing shopping patterns.

Households were purchasing food at the supermarket (74%), market (60%) and/or local shop (74%) (Table 23). Two supermarkets, located in St. John's, provided a wide selection of imported foods and resembled supermarkets in the U.S. Although the produce section of these stores was somewhat small compared to American ones and usually displayed more imported than local items at the time of the survey, several Antiguan women could be found selling local produce across the street from these stores. By contrast, the open market, located several blocks away, was open every day, but displayed its greatest activity on Saturdays. At that time, local women and some from neighboring islands sold fruits, vegetables and fish, while the men butchered

and sold meat. The local shop is a small business located in a residential neighborhood or village. A shop in Bolans Village stocked canned meats, vegetables, condiments, flour and other staples, saltfish, frozen chicken and household paper products, among other items. About one-half of the households were using both the supermarket and local shop (Table 23). Since two out of the three types of food shops sold mostly imported processed goods and in the majority of households sampled at least part of the food shopping was taking place at the supermarket or local shop, Antiguans appear to be well-exposed to imported foods.

## 2. Vegetable Purchasing Patterns

Almost the same proportion of households reported buying vegetables during the growing season (89%) as during the off-season 90%. The preference for fresh vegetables was apparent when 68% of the respondents indicated that they buy only fresh vegetables during the growing season and 63% indicated that they buy only fresh vegetables during the off-season (Table 24). Twenty-one percent of the respondents reported buying frozen and/or canned vegetables in the growing season and 27% reported buying these products in the off-season. About 19% of the respondents reported that they buy canned vegetables even during the growing

season.

### 3. Crop Production

About 64% of the respondents indicated that they grow crops (Table 25). Of these, 70% had a backyard garden; the remaining respondents had access to a "ground" (usually a larger plot and located at some distance from the house), or both a backyard garden and ground. The vast majority of respondents with a ground were living in the villages. However, 45% of urban respondents were engaged in backyard agriculture.

The average garden or ground was planted with five crops. Crops raised by households were placed into the seven categories shown in Table 26. These categories were chosen to reflect nutritional differences among crop types. The numbers of individuals producing crops in more than one category are given. Root crops such as cassava and sweet potatoes, fruits such as bananas, papaws (papaya), coconut, mangoes, limes, soursops and sugarapples, vegetables such as "antrobbers" (eggplant) and peas (legumes) and sugarcane were the most frequently listed crops in home production. Nearly 85% of the respondents growing crops were raising at least one fruit crop and consuming part or all of the fruit. Almost half (46%) were growing at least one kind of starchy



root crop for consumption. Green and yellow vegetables and peas or beans were listed by 39%, 20% and 20% of the respondents, respectively. Sugarcane was planted by 24% of the respondents and was mostly consumed. About 40% of the respondents growing crops were selling at least part of their crops (Table 27). Thus, it appears that many of the crop growers' households in the sample had the opportunity to benefit economically as well as nutritionally from the plots.

#### 4. Animal-Raising Practices

Respondents were asked to identify which of the animals listed, if any, were being raised for household consumption. The proportion of those raised that was being consumed was not specified. A total of 29% of the respondents were raising chickens (Table 28); of these, 55% were raising them only for eggs and the rest for both eggs and meat (Table 29). The next most important species raised for food was cattle. Thirty-nine respondents (13% of the sample) were raising cattle. Most households raising cattle did so for the milk production; very few used only the meat (Table 29). Twenty-six households (8%) were reportedly raising pigs and 25 were raising sheep, while 10% indicated that they had goats. Respondents were also asked if they raise

rabbits; however, none did. Only a small percentage of households in the city were raising animals.

About 24% of the respondents were raising animals to sell, exchange or give away (and also possibly to consume) (Table 30). Of these individuals, most (77%) were selling some or all of their animal(s) and few were giving animals away to others (15%), selling and giving away their animals (7%) or selling, exchanging and giving away animals (one individual).

#### 5. Food Resources Scores

The food resources of a household are potentially important variables affecting food habits and dietary quality. Thus, data on crops and animals raised for consumption and/or sale was used to generate a food resources score that was calculated in the following manner. Crops raised by respondents' households were placed into the 7 categories shown in Table 31. Items used as condiments were excluded from the analysis because they are used in very small amounts. Crop categories were chosen to reflect nutritional differences between crops. If the respondent's household produced at least one crop listed in a particular crop category, the respondent received a point. A maximum of 7 points were possible if the household produced at least

one crop from every category. This score was named "Crop frequency." The score "Animal frequency" was calculated by adding up the different animal products raised for household consumption. The maximum number of products (cattle raised for meat and milk counted as two different products, as did chicken raised for both meat and eggs) was 7. The sum of the "Crop frequency" and "Animal frequency" scores for an individual is the individual's "Food Resources Score," which has a maximum value of 14. Frequency distributions of each of these scores are shown in Table 31.

Seventy-three percent of respondents' households produced a crop or animal resource - 64% produced crops and 44% raised animals. Approximately three-fourths of all crop producers raised 3 or fewer different types of crops and approximately 91% of all animal stock owners produced 3 or fewer different types of animal products. Table 32 reveals that 47% of animal raisers sold part or all of their animals (62 divided by 133, the total number of households raising animals for food) and 40% of crop producers sold part or all of their crops. Also, 54% of crop producers were producing both crops and animals for home consumption (106 divided by 196), whereas 80% of animal raisers were producing and consuming both. Thus, it was common for Antiguan raising animals to also raise crops.

## 6. Fishing Activity

About 17% of the respondents reported that someone in their households did some fishing. About 59% of those fishermen resided in the villages. In general, fishing activity in the household did not appear to strikingly affect the proportion of respondents consuming fresh fish, frozen fish, saltfish, canned fish, smoked or red herring, or pickled mackerel or shad on a daily, weekly or monthly basis (Table 33). That is, household fishing activity did not increase or decrease the proportion of respondents consuming selected fish products on a daily, weekly or monthly basis. For example, about two-thirds of the individuals in each group - fishermen versus non-fishermen - were eating fresh fish several times a week. Also, 64% of each group did not eat frozen fish at all. However, it did appear that respondents from households that fished were more likely to eat fresh fish daily or several times a week. Also, respondents from non-fishing households were more likely to eat saltfish several times a week.

## C. Food Consumption

### 1. Fruits and Vegetables

Frequency data on the consumption of selected fruits

and vegetables revealed that fresh fruits, ground provisions (potatoes, yams and other starchy root crops) and dark green leafy vegetables were consumed frequently by most respondents (see Table 34). For example, 76% reported eating dark green leafy vegetables and fresh fruits at least several times a week. Ground provisions were being consumed at least several times a week by 60% of the respondents and at least once a week by 90% of the respondents. Although 70% of the respondents were reportedly eating canned vegetables at least once a week, 14% stated that they do not eat this kind of vegetable at all. One informant remarked that canned vegetables are a special dish which may be served, for example, with Sunday dinner. Home canning (and even canning of local vegetables at the single processing plant on the island) is not practiced. The high frequency of consumption of fresh vegetables may reflect the fact that the survey was conducted during the growing (rainy) season when respondents had only to visit most of the various food stores to find a large variety and number of vegetables and fruits. Many had access to produce from household gardens, as well.

## 2. Fish Products

Fresh fish and saltfish were the most popular of the

selected seafood products - 53% of the respondents consumed fresh fish and 42% consumed saltfish several times a week (Table 35). Fresh fish is sold primarily in the open market in St. John's, and sometimes directly off the fishing boats at any of several landing spots along the coastline of St. Mary's Parish. In the market, different species of fish are piled together un-iced in large straw baskets behind a counter. When a customer wants fish, the vendor, usually a woman, weighs the appropriate amount of whole fish on a metal balance. Saltfish are sold in the supermarkets and local shops. Although 29% of the respondents reported that they do not eat canned fish at all, 44% reported that they ate it at least once a week. Canned fish is sold at both the local shops and supermarkets. Frozen fish was not eaten at all by 62% of the respondents; however, about one-fourth of the respondents ate it at least once a week. Frozen fish is sold primarily through the supermarkets. A considerable proportion of respondents did not consume smoked herring (54%) or pickled mackerel (40%). However, it appears that close to one-fourth of the individuals surveyed ate pickled mackerel at least once a week. These smoked and pickled fish products were available at the supermarkets and to a more limited extent at local stores.

When asked if they would eat these seafood products

more often if given the chance, most respondents said yes for fresh fish and saltfish (83% and 63%, respectively) (Table 36). Forty percent seemed interested in consuming more canned fish and pickled mackerel. Only about 30% of the respondents would eat more frozen fish or herring. The demand for fish products, particularly fresh fish and saltfish, is high. In the case of fresh fish, it appears that the amount of catch is a major factor limiting the availability of the product (Brownell, 1978).

Since fresh fish and saltfish appeared to be prominent items in the diet of Antiguans, it might be hypothesized that consumption of these foods is high across all groups of respondents, where those groups may be differentiated by any socioeconomic characteristic of interest. A step-wise multiple regression was used to analyze the extent to which selected economic variables (number of rooms in the house, "Basic" and "Luxury") account for the variance in fresh fish and saltfish consumption (Table 37). The correlation matrix from this regression shows very low correlations among the variables; in other words, neither fresh fish nor saltfish consumption is associated with any particular economic group as defined by house size and accumulated household wealth.

### 3. Subsample Food Frequency Data

Twenty-eight respondents granted an additional interview in which they were asked, for selected food items, which family members were eating the food and how often. Food frequencies are shown in Table 38. In the majority of cases, everyone in the family was consuming all of the foods mentioned. Results show that most families were consuming milk, bread and vitamins or fortified food beverage powders (eg, Ovaltine, Milo) daily. Although most families were using canned milk, some were also using fresh and/or dried milk. Except for fresh milk and bread, these daily items are imports as consumed. Bread is produced by local bakeries and is a staple food in Antigua (see discussions in sections C 4a., b. and c.). The extensive use of fortified food beverage powders or vitamins probably reflects the influence of television and radio advertising. At the time of the survey, one advertisement for Ovaltine was regularly broadcast on the local television station during the dinner hour. Also, a local health authority was using TV and radio to broadcast programs about diet and health.

Most respondents were consuming a variety of protein sources on a weekly basis, with emphasis on eggs, chicken and beef across the subsample. Cost data revealed that imported chicken wings (EC \$2.36 per pound), local stew beef (EC \$1.80 per pound) and pickled chicken meat packaged



locally (EC \$2.28 per pound) were among the cheapest meats sold (US \$1.00 = EC \$2.69). Chicken was the meat most frequently eaten during the week. Most respondents reported that they were consuming relatively cheaper chicken parts - the leg, wing and back or neck. All 28 respondents were consuming some kind of beef product on a weekly basis, with local beef consumed most frequently, followed by imported saltbeef. While local beef is usually only sold at the open market on Saturdays (and thus requires refrigeration if used at a later date), frozen chicken wings are always available, and may thus be purchased daily, if necessary (Bird, 1984). Mutton, pork and goat (traditionally prepared as "goat water" or goat stew) were contributing protein to the diets of a number of respondents and their families on a weekly basis, although the majority indicated that they seldom, if ever, ate these meats. All three animals may be raised locally (see section B. 4.). Although fish consumption is high in Antigua (see section C 2.), very few respondents reported eating lobster, conch or crab on more than a monthly basis. Local lobster is eagerly sought by hotel and cruise ship restaurateurs and is thus of limited availability to the general population. Crab is well-accepted (Bird, 1984), but may also be relatively unavailable due to competition with tourist businesses or

because there is greater demand for other local seafood products. Conch is typically served at local restaurants (Bird, 1984); only four individuals, each from the city, reported consuming it on a weekly basis. Peas (also called "red bean peas") or beans and peanuts and other nuts provided additional sources of protein for most respondents on a weekly basis. Peas and beans are usually mixed with rice (see section 4).

Rice, plaintain, fungee (corn meal pudding often mixed with okra) and dumplings were reportedly consumed on a weekly basis by most respondents and may thus be considered as important starches in the diet. Rice is often the core of a one-pot meal (see section 4). For example, a pot of rice may contain pieces of a starchy root crop such as sweet potato, other vegetables and chicken wings or pieces of beef. Plaintain is sliced and fried in oil as a side dish. Funggee (or dumplings) is a traditional accompaniment to saltfish; funggee may also be served with pepperpot, a stewed vegetable dish.

Various kinds of fruits and vegetables appeared to be frequently eaten. Twenty-six out of 28 respondents reported eating yellow vegetables (probably carrot - see the following section) at least once a week. Antigua relies on fresh fruit imports from local islands such as Dominica and

Montserrat (Bird, 1984); fresh fruits were frequently consumed by more than half of the respondents. Canned fruit juice is often a substitute for fresh fruit (Bird, 1984) and was apparently consumed daily by about one-fifth of the respondents. Canned fruit is considered by some to be a dessert for special occasions (Bird, 1984); fewer respondents reported eating this fruit product than the other types of fruits listed.

Soft drinks and desserts were daily items in the diets of about one-fourth of the respondents and/or their families. In eighteen out of the 21 cases reportedly consuming soft drinks, all household members were drinking the products.

While this list of foods is not totally representative of the Antiguan diet, it does provide two things: an indication of the extent of import dependency in major food categories as well as the persistence of some traditional food ways. Antiguan clearly rely on meat, milk, grain and fruit imports; however, local beef, pork and goat meat are also frequently consumed. By contrast, lobster (and perhaps other local seafoods) are local protein sources which have become profitable exports for some individuals. Rice, plaintain, fungee and dumplings, although made with mostly imported ingredients, are considered to be traditional food

items and are apparently still prominent in many diets. It would be interesting to see if a traditional vegetarian diet such as peas or beans with rice becomes more widespread with the increasing cost of imported meats and the continued influence of some Rastafarians (a local religious group) who preach against meat consumption (see section D 2.), as well as that of the government school system's home economics program, which is beginning to stress traditional food use (Hurst, 1982).

Two imported products have seemingly become "core" items according to apparent frequency of use in this data: canned milk and fortified food beverage powders such as Ovaltine, Milo and Complan. Canned milk is mostly added to leaf tea or diluted with water and mixed with a fortified food beverage powder which, with sugar or other ingredients optional, is often called "tea" (Bird, 1984). This beverage is most frequently consumed in the morning. The powders are extensively used by respondents of apparently all ages and socioeconomic backgrounds and have the potential of significantly upgrading the diets of many respondents (see Manuscript 1).

#### 4. 24-hour Recall Intakes

##### a. Frequencies of foods consumed

The individual foods listed on all the 24-hour recalls were grouped into 13 selected food categories which were hypothesized to be culturally, as well as nutritionally, appropriate (Table 39). The largest group (by the total frequency of items listed) was the meat group, which constituted 20% of the foods listed. This group included fish and chicken, the two most frequently listed meats, as well as turkey, pork, egg, beef and mutton. Saltfish was the most frequently listed fish product, followed by fresh fish. Even though pork was frequently listed elsewhere in the questionnaire as a food that was avoided (see section D 2.), it was listed more often than beef in the 24-hour recalls. Eggs were the next most frequently consumed protein after fish and chicken. "Mixed protein dishes," including meat mixed with vegetables or rice, soup, pizza and fabricated meats such as chicken franks, were considered as a separate kind of protein dish, inasmuch as the protein was usually diluted (and also supplemented) by other ingredients. This type of dish constituted about 5% of the items listed. More than one key informant stated that Antiguans love bread - this was supported by the finding that bread, with or without cheese or meat, was the second most frequently consumed food group after the meat group. Other starches, such as starchy root crops, pasta and rice,

were also important items in the diets, constituting about 14% of the foods listed. Vegetables figured prominently, as might be expected during the growing season. By contrast, fruits constituted only a small proportion of foods eaten. "Juice" or various fruit drinks constituted the largest group of beverages, outnumbering sodas by more than two to one. Tea and milk were popular individual beverages. Breakfast-type cereals, legume dishes (beans or peas with rice) and dessert/snacks constituted the remaining food groups. Vitamin supplements, taken exclusively as powders mixed with milk or water, were listed frequently and appear to be one indication that many Antiguanans are health-conscious.

b. Pattern analysis of foods consumed

Although frequency counts indicate foods frequently consumed, they do not give any information about food patterns, or foods which are consumed together. In order to obtain this kind of information, two analyses were made: exploratory factor analysis for extraction of overall food clusters or factors and a meal pattern analysis based on the 11 selected categories from section 4 a.

Exploratory factor analysis was chosen as a device to reduce the vast array of recall items to clusters of foods.

These clusters, composed of foods which covary in the data, may or may not represent a full day's intake, but reflect food patterning, or foods consumed with other foods in the data. When foods listed less than 2% of the time were excluded from the factor analysis, 77 of the original 164 foods remained. Varimax rotation using an eigenvalue of 2.0 produced 6 factors, listed in decreasing order of the proportion of total variance explained by each factor (Table 40). Factor 1 shows a strong association among certain breakfast-type foods. This factor turned up in every analysis performed, through a series in which different numbers of variables, eigenvalues and even oblique rotation were used. Factor 2 lists cabbage and carrot, a pair commonly found in home gardens as well as on the table. This is also one of the two factors which lists a vitamin supplement (Ovaltine). Factor 2 also shows several patterns common to factors 2 through 6: two or more protein sources, at least one fresh vegetable and carbohydrate dishes in the form of bread, starchy root crops, macaroni and cheese and/or traditional dishes such as fungee (corn pudding) and dumpling. In factors 3, 4 and 6, saltfish loads high or highest. Saltfish and fungee, a traditional pair of foods, load on factor 4, in association with butter, vegetables and two bread and meat dishes. The apparent mixture of

traditional foods with other items in several factors contrasts with work done in West Finland by Pelto et al (1987) in which 24-hour recall data was factor analyzed, producing two factors corresponding to "modern food use" and "traditional food use." In Antigua, it does not appear that there are two such distinct food behavior patterns. Factors 3 and 4 list bread served with sardine, pork or luncheon meat. Sardines and sausage together constituted slightly more than half of the meat accompaniments to bread in the bread dish category (Table 39). Another liquid vitamin supplement called Milo loads highest on factor 5. Factors 3 through 6 show that fish was consumed in conjunction with several different food patterns - eg, ones such as factors 3 and 6, in which a variety of vegetables and fruits are consumed, and ones such as factors 4 and 5, characterized by several different protein sources. Imported items, such as coffee, cream of wheat, vitamin supplements and meats, were mixed with local ones, such as fresh vegetables, fruits and breads (bakeries are located in the city), in almost every factor. A local fruit juice (sorrel drink or lemonade), coffee, chocolate milk and water were the beverages associated with the food patterns. Tea was absent from the factors, presumably because it was not strongly associated with any pattern.



In summary, factor analysis revealed six factors representing patterns of foods consumed more than 2% of the time during the given 24-hour period. The strongest association appeared to be among breakfast-type foods. Saltfish, beef and egg were common protein sources, with saltfish loading high or highest on three factors. Vegetables commonly loading on factors included carrot, cabbage, tomato and eggplant and starchy root crops such as sweet potato, plaintain, yam and white potatoes. Food pairs typical of the Antiguan diet showed up in factors 2 (cabbage/carrot) and 4 (saltfish/fungee). At least two factors (2 and 3) included a large variety of fresh vegetables and fruits. Several factors (4 and 5) included a variety of protein sources. The importance of bread in the diet was evidenced by the presence of bread with or without meat in four out of six factors. All these factors are presumed to represent food patterns typical of Antiguan diets at the time of the survey, even though they do not include all frequently consumed items during the given 24-hour period. It may be assumed that, over the entire sample, the patterns detected and the proportion of respondents associated with these patterns is constant, at least for the time of year in which the survey was conducted.

Although factor analysis is useful for extracting food patterns from 24-hour recall data, it is not known what time periods and therefore which meal structures these clusters may encompass. Therefore, an additional pattern analysis was conducted on the 24-hour recall data. In this analysis, individual food consumption was divided into the appropriate time periods as reported: am (up until 12 noon), afternoon (12 to 4 pm) and evening (4 pm to midnight). Different food categories present were then noted, using all the food categories listed in Table 39, with the exclusion of alcohol, as reference (12 categories total). For example, one am pattern observed included a meat, a starch and a beverage. Frequencies of patterns were then tallied for each time period. In addition, food frequencies for the three time periods were calculated. The results (Table 41) give the following information:

1. a list of most of the foods eaten in the morning, afternoon and evening
2. the relative importance (primary, secondary, peripheral) of these foods by the number of individuals consuming them at each time of day (Table 41a). For most categories, foods fell naturally into groupings according to frequency. The terms primary, secondary and peripheral are

not intended to be equivalent to those discussed by other authors (Passim and Bennett, 1943; Jerome, 1975 and Sanjur, 1982) who wish to denote other characteristics such as the emotional importance as well as the frequency of consumption of foods.

3. food patterns accounting for the majority of respondents eating at each time of day (Table 41b) (in all three time periods, a certain proportion of respondents' diets were too variable to conform to any overall pattern).

4. for each food category, the total number of items consumed, the number of different types of items and the number of individuals represented.

5. the number of respondents not eating at each time of day.

The morning food patterns shown account for 73% of the respondents who ate in the morning on the day in question (n=290). Fifteen individuals consumed nothing on the morning of that day. Of the five most numerous am patterns, meat with starch and bread dishes were prominent. As pointed out previously, foods were coded exactly as they were recorded on the recall forms. Therefore, it is assumed that bread and egg listed separately as a meat and starch are different in some way from a bread and egg dish. Egg is

the primary protein at this time of day. Other meats frequently consumed are pork and saltfish. Eggplant, listed as a primary vegetable in the am, is frequently served with saltfish (see previous discussion). Among the peripheral meats eaten, pork and fish products are common. It should be noted that there were 39 more meat items eaten than there were individuals under this category. Some individuals apparently consumed more than one kind of meat. Also, at least 60% of the respondents eating in the morning consumed some animal protein at that time. By far the most popular starch eaten was bread with or without butter. Bread and cheese was the primary bread dish, followed by bread and sausage. Fruits and vegetables played a minor role in morning food patterns; only nine different types of vegetables and eight different types of fruit were mentioned among the 290 respondents. The primary fruit was banana, which is grown locally and also imported from Dominica and Montserrat (Ministry of Finance, 1978). Cereal and milk alone were consumed by a few individuals (15). However, a total of 35 respondents consumed cereal and milk either as their basic am pattern or in combination with other patterns such as meat and starch or bread. Imported, ready-to-eat cereals such as Cream of Wheat and cornflakes were listed, as well as at least one homemade product (corn flour

cereal). Milk was a major beverage in the am, as an accompaniment not only to cereal, but also to some meat-starch, starch and bread patterns. As discussed previously (see section C 3.), milk is commonly mixed with a fortified food beverage powder such as Ovaltine, Milo or Complan and other optional ingredients such as water, tea and sugar. Seventy-four of the 82 individuals who listed a fortified food beverage in their 24-hour recall consumed it in the morning. As shown, consumption of the powders was associated with a variety of am patterns. Tea with milk and sugar was the most frequently consumed am beverage. Coffee, "juice" (a fruit drink with some fruit juice added), orange juice and lemonade were other beverages in the am patterns.

The afternoon patterns show many more types of combinations of foods than the am patterns. They include two new categories, legumes and ground provisions, and exclude fruits as a major category. The major am patterns of meat-starch, bread and starch were extended to include vegetables, legumes and ground provisions. In addition, the cereal and milk pattern was retained to a minor extent. The primary noon-time meat was chicken, as opposed to egg in the morning. Secondary meats included saltfish, as before, with the addition of beef and fresh fish. At least 83% of the respondents who ate between noon and 4 pm consumed an animal

protein at that time and there were some individuals eating more than one meat. A legume dish, primarily rice and beans, was served with meat and other items in many cases, but never as the sole protein source during the afternoon period. Kinds of starches consumed at this time were much more variable than in the morning, although bread with butter remained important. Traditional starchy dishes such as fungee (corn meal pudding cooked with okra) and dumpling were served at this time, as well as macaroni dishes. The variety of bread dishes in the afternoon was virtually the same as in the morning, although there were only a third as many respondents eating only bread dishes in the afternoon as the morning. The types of vegetables served in the afternoon and the number of respondents consuming them both changed, however. Whereas tomato, cucumber and eggplant or okra were eaten in the morning, cabbage, rice and vegetables, carrots and mixed vegetable dishes were prepared in the afternoon. In addition, 32 individuals ate ground provisions, mainly sweet potato, plaintain or white potatoes, which were primarily served with a basic meat-legume or meat-starch pattern. The cereal and milk pattern was extended in a few cases to include a meat-starch pattern. The morning tea changed to "juice" and malt, with sodas, limeade, orange juice and water as peripheral

beverages.

The evening patterns, encompassing foods eaten from 4 pm to midnight, appear very much the same as the afternoon patterns with regards to number of items and respondents consuming those items per category, and variety and combination of categories. No cereals were reported consumed during this time period.

In general these patterns show several striking features. First, the overall diet appears to be starch- and protein- based by variety. Secondly, as extensions of this basic diet, the afternoon and evening patterns appear to be more complex and include a greater number and variety of meats and vegetables and a greater variety of starches. They also include a significant (by frequency) consumption of ground provisions and legumes. Thirdly, the am food patterns are the only ones which include a significant intake of fruits and milk. This latter finding is unusual since the survey was conducted during the growing season of a relatively successful (non-drought) year. At other times of the year or in drought years, one might expect fruit consumption to be extremely low with little local production and increased reliance on imports. It is significant that of the 16 respondents who reportedly did not eat breakfast, only one consumed milk or fruit later in the day and six

reportedly ate nothing from those food groups for the 24-hour period.

Many features of the afternoon and evening food patterns coincide with the "traditional breakfast (noon) patterns" of English-speaking South Caribbean islanders as described by Jerome (1975). Jerome ascribed the terms "core," "secondary core" and "peripheral" to groups of foods eaten at noon. These groups largely coincide with the primary, secondary and peripheral food groups in the noon and pm patterns of this analysis, indicating that Antiguan still follow a largely starch-based diet that is traditional in some areas of the Caribbean. In both analyses, fish (including saltfish), chicken, beef and pork are the major meats eaten at noon. Although Jerome cited fish and saltfish as "core" meats at noon, chicken appears to be prominent in Antigua in both the noon and pm patterns. Other similarities between Jerome's "noon" patterns and the afternoon and evening patterns in Antigua include the "core" (primary) and "secondary core" (secondary) ground provisions, vegetables, starches and legumes. It is important to note that the Antiguan data was collected during the growing season when fresh produce was presumably at maximum availability and minimum price, at least where local crops were concerned. Thus, the degree of fruit and



vegetable consumption may overestimate year-round consumption. Eggs are a core or primary item in both the traditional and Antiguan am patterns. However, Antiguans eat more fruit in the am, in contrast to the traditional pattern of fruit at noon or in the evening. Interestingly, Jerome did not list bread for the noon pattern, although it is "core" to the am (breakfast) pattern she described. Antiguans have apparently adopted a favorite starch - bread - and developed meal patterns around it, as evidenced by the frequency of bread dish-based patterns throughout the day. Also, fungee, an important starch in the Antiguan noon and pm patterns, appears to be the Antiguan version of "coo-coo," a traditional dish listed as a core cereal item in Jerome's noon patterns.

In summary, a meal pattern analysis of the 24-hour recall data revealed a starch and protein-based diet with more vegetables, ground provisions and legumes consumed in the afternoon and evening and more fruits, milk and cereal in the morning. When compared to traditional meal patterns of English-speaking South Caribbean islanders (Jerome, 1975), Antiguan diets appear to have retained many features of a traditional Caribbean diet with local adaptations such as decreased consumption of fruit and increased consumption of bread and chicken.

### c. Dietary Complexity Scores

Dietary complexity, as a reflection of the variety of foods in the diet, has been associated with dietary status (Caliendo et al, 1976 and Marchione, 1981). Dietary complexity, as measured by a Guttman scale, was also demonstrated to increase with greater socioeconomic complexity of the individual and household (Chassy et al, 1967; Sanjur et al, 1970 and Beaudry-Darisme et al, 1972). The implication is that increased dietary complexity reflects an increased variety of foods in the diet, which gives greater chances for good nutrition or good "dietary quality." Since one of the major sources of food behavior data in the survey, the 24-hour recall, emphasized the variety of foods consumed and food preparation methods used over food quantity, the use of this data as an estimation of dietary quality via dietary complexity is appropriate, within the limitations of one-day recall data. Therefore, a Complexity Score was calculated as the sum of all the dishes consumed (eg fish, yams, beef and rice, etc as listed according to the 24-hour recall format) by a given individual during the 24-hour period, and ranged from 0 to 18 (Figure 1). An individual's score also reflects any dish or dishes eaten more than once during the 24-hour period.

Correlations (using Kendall's tau b) between the

Dietary Complexity (DC) Score, a Dietary Adequacy (DA) Score (a score reflecting the presence of six selected food groups in the diet) and socioeconomic variables hypothesized to be related to these dietary measures are shown in Table 42. These socioeconomic variables include factors indicating household wealth (section A 4b.), household food resources (section B 3. and 4.) and the cosmopolitan character of the respondent and his/her household (section A 5.). Results show that dietary complexity correlates significantly ( $p < 0.05$ ) with Dietary Adequacy, a score based on the variety of selected food groups (Proteins, Starches, Dairy foods, Vitamin A-containing foods, Vitamin C-containing foods and Other fruits and vegetables) present in the 24-hour recall intake. However, the magnitude of the coefficient - 0.34 - indicates that beyond a point, the number of items consumed fails to reflect the nutrient variety consumed (or Dietary Adequacy Score attained). This might be expected in a starch-based diet (where a large proportion of the foods consumed are starchy) and throws into question the usefulness of a complexity measure under such circumstances. Dietary Complexity also significantly correlated ( $p < 0.05$ ) with three measures of relative wealth: the cluster of household items called "Luxury," number of rooms in the house and ownership of a car. Thus, wealthier

households, as defined by these measures, eat more items during the day. Related to this is the significant correlation of the DC Score with the occupation level of the chief wage earner. Higher level occupations would presumably bring in higher earnings and allow more food purchases, other factors being equal. Having a food preparer in the household who received nutrition education also appears to benefit dietary complexity. Travel abroad by someone in the household, having a friend from overseas and having relatives who live overseas were all significantly ( $p < 0.01$ ) correlated with dietary complexity, suggesting that some exposure to new ideas, practices or customs may affect the diet, or that the kind of people having friends from overseas are also the kind of people who have a more varied diet.

The remaining correlations, which deal with food resource activity in the household, show apparent contradictions, some of which may stem from the choice of the dietary variable and some which may have been influenced by the way the resource activity was measured. Household fishing activity appears to correlate with dietary complexity and dietary adequacy, but raising animals or crops, or selling animals or crops, do not. It is likely that these resource measures were not sensitive enough. For

example, "selling animals" and "selling crops" may only differentiate respondents at a certain socioeconomic level as defined by other variables which have an overall greater effect on dietary complexity or variety. Also, although the animal, crop and overall resources scores accounted for variety of crops and animals raised, they did not take the quantity raised into account. Quantity of resource would potentially affect the nutritional as well as economic benefits of the resource. In addition, it is apparent from Table 43 that a number of individuals were giving away resources and/or exchanging them. The precise meaning of these activities and their implications were left unexplored. In summary, greater detail was required in the following areas:

1. the magnitude of resources
2. the circumstances under which food resources are given away or received by a household and the results (distribution, additional income, etc.)
3. use of cash or spendable income resulting from the sale of food resources.

Until such information is collected, it would seem premature to conclude that food resources and dietary measures were not related.

Focusing exclusively on the subsample of respondents

who raised their own food and examining the effect of resource consumption, sale or both on dietary complexity might be a different way to discover a relationship between food resources and diet. To do this, respondents raising both crops and animals were placed into a data subset. Out of this subset, respondents who stated that they sold at least part of their crops and at least part of their animals ("sell" group) were separated from respondents who were only consuming their crops and animals ("eat" group). Either group may include a small proportion of respondents who were also giving food resources away or exchanging them for other things. Figure 2 shows that the peak complexity score for the group that sold part or all of its resources is shifted slightly higher than the peak complexity score for the group that doesn't sell any of its resources. Apparently, both extra cash and food for household consumption may have an influence on the dietary complexity of Antiguanans. It would thus seem important to know who receives the income from household food production and how that income is used.

#### D. Food Beliefs and Perceptions

##### 1. Selection of Extra Food Purchases

Respondents were asked which foods they would buy and

why if they had more money to spend on food. Of the foods listed (Table 43), roughly one-fourth were meat, milk, cheese and eggs, about one-fourth were vegetables (excluding cabbage and carrots), 17% were cabbage and carrots and 17% were staple grains and cereals. The remaining food groups included peas and beans, fruits and fruit products, starches and sugar/butter. Several respondents listed either "nutritious foods" or vitamin supplements. A few responded that they would buy everything, nothing or more of the same foods they usually purchase. Of the meat, milk, cheese and egg group, milk was listed most frequently, for primarily health-related reasons ("for body strength and health," "contains vitamins," "builds the body," "rich in protein," "nutritious," etc.). Fowl - mostly chicken - was the next most frequently listed protein group for preference reasons ("like it," "prefer it") as well as health-related ones ("nutritious," "good for the body," etc.). Vegetables - particularly sweet potatoes, white potatoes, tomato, lettuce, spinach, beets and "vegetables" - were also frequently listed for reasons related to health, preference and availability, in order of decreasing frequency. Typical health-related reasons for choosing vegetables included "nutritious," "contains lots of vitamins," "good for the body" and "doctor's advice." Cabbage and carrot were

separated out from the other vegetables when it became apparent that the frequencies with which these two foods were mentioned were much than that for any other food listed, except for rice. Also, other data from the questionnaire and from field notes indicated that cabbage and carrot were prominent foods and often occurred together (see sections B. 3 and C. 4). Staple grains and cereals included rice, the single most frequently listed food, flour and corn meal. Reasons for choosing rice included preference (accounting for 40% of the reasons given), availability ("scarce at times," "need to buy what isn't obtained, grown or harvested yet," "not produced locally"), need ("use or need more (or a lot)," "most eaten of all foods") and miscellaneous reasons such as "need to mix with other foods." The first and second most frequently listed reasons for purchasing more corn meal were preference and "to mix with other foods." Flour was associated with availability, need and "to mix with other foods." Peas and beans, fruits and fruit products and vitamin supplements were listed by respondents for mainly health-related reasons. Starches such as spaghetti, macaroni and cheese and bread were chosen mostly because they were liked.

a. Health-related reasons for purchasing extra



foods

About 52% of the total number of foods listed as desirable extra purchases were associated with the health-related food concepts in Table 44. This, in addition to the specificity of some of the concepts, indicates that nutrition-related messages about food were being received and retained.

The concepts in Table 44 may be classified using an adaptation of a scheme suggested by Beaudry-Darisme et al (1972) in a study of food habits in St. Vincent. In that study, respondents' reasons for labeling certain foods as good or bad during infancy, pregnancy and lactation were placed into four categories: "traditional" (eg, unspecific reasons such as "is good for"), "example of others," "influence of a nurse or doctor" or "nutritional reason," which included a nutrition term whether correct or incorrect. "Traditional" reasons listed in Table 28 might be "for body strength and health," "builds the body," "very substantial," "good for the body" and "good for the blood." A number of respondents indicated that they were guided by a doctor's advice. The reasons which included a nutrition term or concept were "nutritious," "contains lots of vitamins," "rich in protein," "protects the body from starch," "for iron," "to give energy," "for a balanced diet"

and "good for sight." The phrase "protects the body from starch" refers to a non-starchy food which is an alternative to more starchy meal items and is deliberately eaten in place of starch (Parker, 1982).

"Nutritious" was the health-related term used most frequently as a reason for choosing a food. The protein sources, milk, fish, beef, "meat," poultry and eggs, were also generally associated with "rich in protein," "contains lots of vitamins," "good for the body" and "for body strength and health." Milk, cheese, fresh fish and poultry were foods characterized as "substantial." The concept "protects the body from starch" was exclusively associated in this data with carrot, cabbage and other non-starchy vegetables. Also associated with these foods were the concepts "for balanced diet" and "doctor's advice/health reasons." This implies that increased consumption of non-starchy vegetables was being encouraged. There are health clinics in St. John's and in 3 out of the 7 villages surveyed, providing the opportunity for doctors, nurses and other health aides to spread health concepts and influence diets.

The data on extra food purchases showed both sophisticated and erroneous nutrition information. For example, carrots were correctly perceived by two respondents

as "good for sight." However, carrots and bananas were perceived to be iron sources by 8 and 5 respondents, respectively. In addition, lettuce and "vegetables" (unspecified) were identified as protein sources by two respondents.

b. Comparison of extra food purchases to 24-hour recall data

This data provided an informative comparison/contrast with the 24-hour recall data (see section C.4). For example, bread, a major item in the recalls, was listed by only two respondents as an extra purchase. Bread, produced in local bakeries that do an active business, is probably so cheap and available to most people that it is not considered to be a special purchase or one requiring additional money or availability. The fact that flour was listed as a desirable extra purchase by about 13% of the respondents may reflect home baking of bread and bread products. Similarly, the fact that about 9% of the respondents listed cornmeal as a food to purchase with extra money probably reflects its use in fungee (cornmeal pudding) or corn flour cereal, among other dishes. The protein dishes in general - meats, fish, eggs and milk - as well as carrots, cabbage, tomato and rice, were listed frequently in both the recall and

preference data. Pork was a special case; first, it was the food most avoided by respondents (see the following section). Secondly, in one form or another, pork accounted for almost 5% of the dishes listed in the 24-hour recalls. Finally, pork was listed as a preferred food purchase by only five individuals who stated that they either liked it, wanted to mix it with other foods or thought of it as something special to buy. Apparently, a minority of Antiguans practice pork avoidance for religious or other strong beliefs, while numerous individuals eat it in a variety of ways. Among these latter consumers, there did not seem to be additional demand for pork products. Finally, although saltfish was listed as frequently consumed (Table 35) and is available in most food stores, it was listed as an extra food purchase by only three respondents. By contrast, fresh fish, also frequently consumed during the 24 hour period, was an item many respondents wished to purchase with extra money. This implies that, among fish consumers, fresh fish is in greater demand than saltfish. While the data implies an overall preference for fresh fish over other selected fish products (see section C 2.), there is also a general shortage of fresh fish in Antigua (Brownell, 1978). Possibly the limited (eg seasonal) availability of fresh fish may also influence perceptions of

it as an extra food purchase.

c. Selection of traditional versus imported foods

Table 45 presents the data from Table 43 with the foods classified so as to show, to the extent possible, the foods that may be locally-produced or are traditional ingredients versus other imported foods.

Part I lists the preferred foods which could be produced locally or which are used in known traditional dishes. Tables 26 (crops grown by respondents' households) and 28 (animals raised by respondents' households) were used as references to determine the range of foods that were being locally produced. A respondent may have listed bananas, chicken and fish as desirable extra purchases and actually buy the products as imports; however, inasmuch as these foods were being raised locally, they can represent the local item or the closest substitution for it for purposes of maintaining a traditional diet. Foods in Part II are individual items or classes of items which are not produced locally or have no known local analog. Milk is included in this list since other data indicate that most of the milk consumed is either canned or powdered (ie, imported - see Table 38).

Although one can make few assumptions about the use of

these foods in the home or the exact nature of the item listed (fresh, processed, etc), it seems that there is little demand for the kinds of foods that cannot be produced locally. Further, it appears that many of the food choices (eg starchy root crops, rice, corn meal cooked with okra to make a pudding, bananas and goat meat), reflect traditional food ways, even though they may require ingredients that are currently imported. While it is not certain to what extent a product such as imported pasta remains a relatively new addition to the Antiguan diet (15% of the respondents listed it in their 24-hour recalls - Table 39), products such as cereals, hot dogs, pizza, mayonnaise and fortified food beverage powders (Ovaltine) are clearly indicative of more modern food use and constitute a minority of the foods listed. These responses may be conservative in nature due to the varying degrees of financial disadvantage many respondents probably experience in the current economic environment in Antigua. That is, "more" money to spend may be interpreted conservatively and not represent a very significant increase in money or opportunity for a change in eating patterns. Nevertheless, it appears that, given an opportunity for change, most of the Antiguans surveyed preferred foods compatible with more traditional food patterns, rather than commercial items or other imports.

## 2. Food Avoidances

Respondents were asked if there were any foods that anyone in their family avoided and if so, for what reason(s). The foods listed were placed in selected categories shown in Table 46, along with the proportion of respondents who listed at least one food per category. Table 46 shows a crosstabulation of food categories with the reasons given, also categorized. Fifty-four percent of the respondents did not practice any particular food avoidances. However, 52 individuals (17%) listed pork, primarily for "religious" reasons or because they or their family members perceived it as "unclean." "Unclean" is a term associated with local food animals which are allowed to wander anywhere, eat anything and are therefore considered filthy and unfit for human consumption (Parker, 1982). Because several respondents claimed to avoid pork for both religious reasons and because they perceived it as "unclean," it appears that these two concepts have become linked together to some extent. The Rastafarians of Antigua, a religious group, have recently been spreading negative concepts about pork (Bird, 1984).

Fifty-two respondents listed a number of items which are grouped together in Table 46 as "traditional" foods of Antigua. These foods include fungee (corn meal pudding

cooked with okra), pepperpot (a vegetable stew made with eggplant, leafy vegetables and other ingredients), dumpling, rice and corn meal. Although some of these foods may represent individual tastes with no common motivation, there was a relatively large number of respondents who listed fungee because they disliked it (32) or did not customarily eat it (5). This suggests not only an unfamiliarity with the dish, but also a rejection of it as a low-status food. Vegetables such as antrobers (eggplant), eddoes, cabbage, peas, carrots, yam, sweet potato and breadfruit were listed because they were disliked, while onion, sweet potato, breadfruit and peppers were listed by a few respondents for health-related reasons. Banana, the only fruit mentioned, was listed as disliked by four respondents. Beef, mutton, chicken and goat were items listed as disliked in several households. One respondent stated that local beef "burned" his stomach. The remaining classes of foods represented the dislikes and health concerns of a relatively small number of people. For example, seafoods such as mackerel, shad, red herring and frozen fish were disliked by several individuals. However, crab, turtle, lobster, conch and shellfish in general were listed by a few respondents as foods avoided for religious reasons, a reference to the dietary customs of Seventh Day Adventists on the island



(Parker, 1982). Starches such as bread, macaroni and white flour were listed as disliked by few respondents and several imported foods such as Coke, mayonnaise, coffee and Cream of Wheat were listed for various reasons. One respondent avoided "tin foods" (canned foods) because of a perceived risk of food poisoning. Shad, fresh fish and shark were also associated with food poisoning in several cases. There is a potential for fish spoilage at the marketing stage, since fresh fish caught by local fishermen are held un-iced at the open market in St. John's.

In summary, food avoidances in Antigua appear to be of three types: the religious avoidance of pork, motivated by Rastafarians, and of shellfish, crustaceans and other fish without scales (the practice of Seventh Day Adventists on the island); the dislike of fungee and other so-called "traditional" foods and various other miscellaneous food avoidances motivated by personal taste and/or health concerns. More data would be required to determine whether the "dislike" of fungee, pepperpot and other so-called "traditional" foods is related to a perception of them as out-dated or undesirable in terms of status. By contrast, most of the reasons associated with choices of extra food purchases were health-related, with emphasis on the strengthening properties of proteins and the use of certain

vegetables according to "doctor's advice" or "to protect the body from starch."

### 3. Perceptions of the Expense and Availability of Selected Foods

A modified semantic differential test board (see Methodology Appendix) was used by respondents to rank their perceptions of the expense or availability of fresh, canned and salted fish, fresh and canned vegetables and milk. The boards represented a 7-point scale, with position number one (left end of the board) representing "inexpensive"/"can get it when I want" and position seven (right end of the board) representing "expensive"/"can't get it at all." Respondents were free to interpret the meaning of gradations between these points. Results show that most respondents perceived saltfish, canned fish and canned vegetables as available when they wanted them (Figure 3), but expensive (Figure 4). Canned meats, canned vegetables and saltfish are sold in both supermarkets in St. John's and most local shops. As imported items, they may be relatively high priced. While fresh fish and fresh vegetables were generally perceived as available (Figure 3), opinions on their expense were more mixed (Figure 4). For example, 27% of those individuals responding to the question rated fresh fish as fairly

expensive (ranking = 6 or 7), while 34% rated the product as fairly inexpensive (ranking = 1 or 2). By comparison, more respondents tended to rate fresh vegetables as expensive (40% gave a rank of 6 or 7) than inexpensive (23% gave a rank of 1 or 2). Milk was also a product considered to be available (83% ranked it as 1 or 2) (Figure 3). However, there was not as clear a trend for opinion about its expense: 44% of those responding thought it expensive (rank = 6 or 7), while 25% thought it inexpensive (rank = 1 or 2) (Figure 4). This may have been a result of the use of the nonspecific term "milk," which could represent different milk products such as canned, powdered or fresh.

Respondents' perceptions of the expense of fresh fish and vegetables were tested for possible associations with other respondent characteristics via the chi-square statistic and Kendall's tau b correlation coefficient. Chi-square test results indicated that the respondent's residence in the city versus the villages, the occupation level of the chief wage earner and whether or not the respondent shopped at the St. John's fish market had no relation to the perceived expense of fresh fish (Table 47). However, it appeared that household fishing activity was significantly ( $p < 0.05$ ) related to lower rankings for the expense of fresh fish (Table 47). This may have occurred

because households that do fishing spend less money on overall fish purchases, or because such households may have been selling fish as well, with the viewpoint that fish prices should be high enough to turn a profit. Residence in the villages as opposed to the city was significantly ( $p < 0.05$ ) related to a lower rating of the expense of fresh vegetables (Table 48). Village residents were more likely to raise their own crops (see section B 3) and could sell or barter those crops with other villagers; Table 48 shows that crop growers generally viewed fresh vegetables as less expensive. However, the majority of city residents, who were not growing food, presumably shopped at either the open market, or the supermarkets, where imported as well as local produce is sold and prices may be further elevated (local shops did not usually carry fresh produce). The general income level of the chief wage earner was not significantly associated with expense ratings of fresh vegetables.

The rank correlation matrix in Table 49 shows that, of all the variables significantly correlated with the rankings of the expense of fresh fish, vegetables and milk, those with the coefficients of greatest magnitude occurred between the rankings themselves. Thus, there was a tendency for respondents who perceived one of the products as expensive to perceive all three as expensive, although the correlation

coefficients are too low for an unequivocal relationship. Respondents from fishing households perceived all three items as less expensive. Also, respondents from households where food resources (crops and animals) were produced, especially households raising only animals, appeared to perceive fresh vegetables as less expensive. This result, and the fact that the perceived expense of fresh vegetables did not correlate significantly with variety of crops raised (Crop frequency), suggests that the reasons behind these perceptions are complex. Perhaps the individuals from food-producing households did not purchase fish, vegetables, milk or fish at all on the market and therefore had no realistic perception of their cost. The cost of certain items may also be immaterial to individuals who don't buy or use them. To clarify the relationship between household food production and the perception of food prices, respondents might judge specific items, eg the perceived expense of a product specified by name, or the ranking of commercial products by expense in comparison to analogous foods produced by the household.

Although most respondents perceived fresh vegetables and fish as available, there were still significant proportions of respondents who did not necessarily feel that these foods were available to them when they wished. For

example, of those individuals responding to the question, 19% and 25% gave fresh vegetables and fresh fish, respectively, a ranking of 5, 6 or 7 (7 = can't get it at all).

In summary, it appears that most of the imported items listed (canned fish, canned vegetables and saltfish) were perceived as expensive but available. Fresh fish and fresh vegetables, primarily local items, were perceived to be somewhat less available and perceptions of their expense differed. Respondents from households that fished appeared to perceive fresh fish as relatively less expensive, while residents of households that were growing crops and/or living in the villages appeared to perceive fresh vegetables as relatively less expensive. Most respondents thought milk was available; the lack of consensus on its expense probably reflects the fact that the kind of milk product referred to was unspecified.

#### 4. Perceived Importance of Selected Concepts When Purchasing Foods

Respondents were asked to rank the importance of several concepts hypothesized to be considerations in deciding which foods to purchase for their families. For example, they were asked how important it is to purchase

food that is "good for you." The end points of a 7-point scale were defined as "unimportant" (1) and "very important" (7) and each respondent identified the point along the scale corresponding to the perceived importance of the concept. Results are shown in Figure 5. All respondents felt strongly that the selected concepts were important when purchasing food for their families. When frequencies for ranks of 6 and 7 were totalled, "family likes the food" appeared to be the most important concept, followed by "its good for you" and the cost of the food. Ease of preparation appeared to be the least important concept of the four. As indicated previously, Antiguanans who have had a government school education are likely to have received some nutrition education. Also, simple nutrition instruction was appearing periodically on local TV and radio programs at the time of the survey. Thus, exposure to food and health principles was probably wide-spread.

##### 5. Perceived Importance of Selected Concepts When Raising Food

Respondents were also requested to rank the importance of selected concepts hypothesized to be considerations in deciding which crops to grow. The majority of respondents giving answers to the question indicated that they were

actually growing crops themselves. The responses of those individuals who were not farming at the time, but who nevertheless wished to answer the question, were counted as well, since they might have farmed before or might have had intentions to do so in the future. A number of individuals who were not farming voluntarily skipped the question. Thus, the responses appear to represent at least those people who were interested in farming, if not those who were farming at the time. Raising a crop that is "easy to grow" and "family likes the food" were ranked as very important (rank = 7) concepts by 64% and 62%, respectively, of those individuals responding to the question (Figure 6). "Cost of growing food compared to market price for the food" was considered very important by 61% of those responding. The profit involved, or the "price you get for the food when you sell it," was the least important of the concepts listed, although 53% of those responding gave it a rank of "very important."

#### E. Summary

##### 1. Sample description

The sample was composed of respondents who were mostly female and ranged in age from 13 to 96. According to



respondents' descriptions, most held the position of mother, daughter, wife, son, other female relative or sole occupant in the household. The average level of education attained by the respondents was that of complete primary schooling, the approximate equivalent to the completion of U. S. grades 1 through 9.

One-third of the respondents were the chief wage earners in the household, a position identified by the respondent. Most of the remaining chief wage earners were the father, boyfriend, husband or mother of the respondent. Although 63% of the chief wage earners were male, there did not appear to be any difference in the mean level of education attained between male and female chief wage earners. For all chief wage earners, occupation level strongly correlated with level of education attained. About 30% of the chief wage earners held positions identified as low-income, such as street cleaner, fisherman, farmer or domestic. In 36% of the cases, the chief wage earner held a medium-income position such as machine operator, taxi driver, artisan or office worker. "White collar" positions such as a teacher, manager or bank clerk were held by 20% of the chief wage earners and very few (3%) held a "professional" position such as nurse, technician or businessman. The majority of chief wage earners were living

at home.

Selected socioeconomic characteristics of other household members revealed that the respondent, the respondent's mother, wife or older child were principle individuals responsible for deciding which foods to buy and for purchasing and preparing food. This indicates that food handling is still largely the domain of women in Antigua. In addition, in about 41% of the households, the individual responsible for food preparation had reportedly received some nutrition education. Nutrition education is taught in the higher grades in government schools; this constituted the source of nutrition instruction for 78% of these individuals. However, about one-fifth reportedly received instruction from radio or television nutrition and health programs. Finally, in 45% of the households, the respondent or another household member had traveled outside of Antigua/Barbuda in the year previous to the time of the survey. Although 61% of these travelers had gone no further than the Eastern Caribbean, it was very common for respondents to have a relative or relatives overseas. Although the exact nature of the motivations for and results of outside contacts such as these are beyond the scope of this study, it appears that Antiguan readily establish outside (off-island) contacts and thus have the opportunity

to be exposed to new ideas and customs. Interestingly, although 77% of the respondents expressed a preference for both international and local news, only about half were actually reading newspapers. Of these, most (79%) listed papers that covered only local news.

## 2. Household wealth

Selected characteristics of respondents' houses provided an indication of household material wealth, an important variable used in subsequent analyses. Houses ranged from 1 to 14 rooms in size. The presence of pre-selected household items (including appliances and recreational items) in each house where an interview took place was noted. A factor analysis of these items produced two factors which were interpreted as different levels of household wealth. Items loading high on the first factor, called "Basic," included a refrigerator, gas stove, radio, black and white TV and electric iron. Items loading high on the second factor, called "Luxury," included an electric clothes washer and dryer, a color TV and an electric fan. In addition to these household wealth indicators, ownership of a car, bike, truck or bus was recorded. Only 20% of the households sampled had a car.

Most houses where interviews took place utilized a pipe

(usually located along a street) access to water. About 39% had private access via running water in the house or a pipe in the yard. Some households appeared to supplement these sources with rainwater collected in cisterns, tanks or drums.

### 3. Food supply

Information on the food supply in Antigua was obtained for two broad areas: food purchased through local markets and home production of food (crops, meat, milk, eggs and fish).

Crop production occurred in about two-thirds of the households sampled, including about 45% of the urban households in the sample. Households used two types of plots for raising crops: a backyard garden (typical in the city) or "ground," a larger plot located at some distance from the home and cultivated largely by village residents. The average garden produced about five crops. Root crops such as cassava and sweet potatoes, fruits such as bananas, papaya, coconut, mangoes and limes, vegetables such as "antrobbers" (the local eggplant) and carrots, peas (legumes) and sugarcane were frequently listed. About 40% of the households were selling at least part of their crop production - some also gave away a proportion of what they

produced. Thus, respondents and their households presumably had the opportunity to benefit economically, as well as nutritionally, from the plots. Despite this wide-spread crop production, the vast majority of respondents reported that they bought vegetables during the growing season as well as other times of the year. Most preferred to buy fresh vegetables; however, 21% reported buying frozen or canned products.

Approximately three-fourths of the respondents reported that food shopping in their households occurred one to three times a week. About 17% reportedly shopped on a daily basis. Slightly more than half of these latter households had a refrigerator; thus, there were probably factors other than food preservation capability motivating daily shopping. Respondents had access to three different kinds of food markets: the local shop and, in St. John's, the supermarkets and open vegetable/meat market (with access by bus from the villages). One local village shop stocked a wide variety of items such as canned vegetables, milk and meats, frozen chicken, condiments and household products such as soap. Fresh vegetables were not sold in this shop. Two supermarkets in town provided the same variety and quantity of imported items one would encounter in an American supermarket. In addition, several women vendors

were usually selling local vegetables across the street from the supermarkets. The open market was a city block where vendors could spread out their produce on the ground for display, or alternatively sell vegetables, meat or fish in a building next to the open square. Fresh vegetables (and other imports) were also purchased from vendors by the government and sold at fixed prices in a nearby store.

Some of the households sampled were supplementing their protein supply by raising animals. For example, 29% of the households were reportedly raising chickens; however, about half of these were only utilizing the eggs produced. About 13% were reportedly raising cattle, in most cases for milk production. Some households were raising pigs, sheep or goats. Very little animal production was reported by urban respondents, although cattle, sheep, pigs and goats were seen wandering loose in St. John's at the time of the survey.

About 17% of the respondents reported that they or someone else in their household catch their own fish. A comparison of eating patterns between respondents who had their own fish and those who did not revealed that the proportion of respondents eating selected fish products (including fresh, salted, smoked and pickled fish) on a daily, weekly and monthly basis was approximately the same

regardless of the fishing activity in the household.

#### 4. Food consumption

Frequency data on the consumption of selected foods revealed that fresh fruits, "ground provisions" (starchy or tuberous root crops) and dark green leafy vegetables were consumed on a weekly basis by most respondents. Canned vegetables were consumed less often; however, this is not necessarily an indication of their lower popularity, since one informant claimed that canned vegetables are a special dish which may be served with Sunday dinner. Other foods frequently consumed by respondents included fresh fish and saltfish, with about half of the respondents consuming at least one of these products several times a week. A majority of respondents also stated that they would eat more of these products if they could. Other fish products such as pickled mackerel, canned fish and smoked herring were consumed less often and almost two-thirds of the respondents reportedly did not eat frozen fish.

Twenty-four hour recall intakes provided data for further analysis of the dietary patterns of Antiguans. The largest food group listed in the recalls (by frequency of items consumed) was the meat group, including beef, chicken, fish, pork and egg. Other major food groups included bread

with fillings, other starches, ground provisions, other vegetables, legume dishes, cereals and beverages. When lists of individual foods consumed were factor analyzed, six patterns (factors) were extracted. One was composed of cereals, milk and sugar (a "breakfast" factor). In the remaining factors, several characteristics emerged: fresh vegetables loaded on four of the factors; several factors exhibited traditional food pairs such as saltfish-fungee, saltfish-dumpling and cabbage-carrot; saltfish, beef and egg were major proteins and bread, with or without meat, was prominent. In addition, a commercially-prepared fortified food beverage powder (Ovaltine or Milo) was associated with two of the six factors. Ovaltine was being promoted heavily through television advertisements at the time of the survey. From this data, it appears that a major characteristic of the Antiguan diet is the mixture of locally-available foods or traditional dishes such as saltfish and fungee with imported items such as coffee, sausage, Cream of Wheat and Ovaltine.

A second analysis of the 24-hour recall data was conducted to discover respondents' meal patterns (combinations of foods at different times of the day) with reference to food groups such as meats, bread dishes, starches, ground provisions, other vegetables, legumes and



cereals. Relative frequencies of foods listed at each mealtime across the entire sample were used to define "primary," "secondary" and "peripheral" foods within each group. Prominent among breakfast patterns were the meat-starch-beverage and bread dish-beverage patterns. Egg was the primary meat dish and bread with cheese the primary bread dish in the morning. Vegetables were consumed to a limited extent at this time. Beverages included tea (with milk and sugar), coffee and juices. The am patterns were the only ones to include a significant (by frequency) consumption of milk and fruits. It is noteworthy that, of the 16 respondents who reportedly did not eat breakfast, only one consumed milk or fruit later in the day. The afternoon patterns showed many more types of combinations of food groups. They also included two new groups, legumes and ground provisions, and excluded fruits as a major category. The primary noon-time meat was chicken, rice replaced bread as the primary starch and a different group of non-starchy vegetables was consumed. The evening meal patterns were extremely similar to the noon ones. These patterns largely coincide with the "traditional breakfast (noon) patterns" of English-speaking South Caribbean islanders as described by Jerome (1975), with local adaptations such as the decreased consumption of fruit and increased consumption of bread and

chicken.

Two dietary variables were calculated from the 24-hour recall data for use in subsequent analyses: one equivalent to the number of different items consumed by an individual (Dietary Complexity Score) and the other a measure of the variety of food groups consumed by an individual with reference to Proteins, Starches, Dairy foods, Vitamin A-containing foods, Vitamin C-containing foods and Other fruits and vegetables (Dietary Adequacy Score). These two scores were significantly intercorrelated ( $p < .05$ ) using Kendall's tau  $b$  coefficient. However, the magnitude of the correlation coefficient indicated that beyond a point, the number of items consumed did not reflect the food group variety consumed. This was interpreted to be a direct result of the fact that the Antiguan diet is starch-based; thus, more items in an individual's diet may simply reflect more starch and proportionately less of other necessary food groups. Dietary Adequacy was therefore selected as a nutritionally more meaningful dietary variable and was found to correlate significantly ( $p < .05$ ) with measures of household wealth, the level of education attained by the respondent, the occupation level of the chief wage earner in the household, the nutrition education of the household food preparer, the marketing of animals produced by the household

and the respondent having a friend from overseas. Thus, a combination of factors - household wealth and food resources, education and exposure to new ideas or customs - appear to be related to dietary adequacy in Antigua.

Twenty eight respondents granted an extra interview in which they were asked, for selected food items, which family members were eating each food and how often. In the majority of cases, everyone in the family was consuming all of the foods listed. Daily (primary) foods for most of these respondents included milk (mostly canned), bread and fortified food beverage powders (Ovaltine, Milo or Complan) or vitamins. In contrast to the 82 respondents who reported using the powders in the recall data, all of the subsample respondents reported using powders or vitamins every week and 75% used them every day. Thus, the use of powders such as Ovaltine may be more frequent than was implied by the recall data. Most subsample respondents were eating a variety of meats, including eggs, chicken and beef (mostly local). Fewer respondents were eating sheep, pork or goat (traditionally served as stew or "goat water"). Seafoods such as lobster, conch and crab are well-accepted (Bird, 1984) but apparently eaten rarely. Lobster is sold mainly to tourist hotels or cruise ships and conch is served in some local restaurants. Other food items that were

reportedly consumed at least once a week by most respondents included rice, plaintain, fungee, dumpling, yellow vegetables, legumes, peanuts, canned fruit juice, imported fresh fruit, soft drinks and dessert. Canned fruit, which is sometimes served as dessert, was consumed less frequently.

As with the 24-hour recall data, the subsample data characterizes the Antiguan diet as a mixture of imported foods such as Ovaltine, canned milk and soft drinks with more traditional foods such as local meats (eg beef and goat) and starches (eg rice, fungee and dumpling). With the variety of foods made available to Antiguan by the presence of the tourist trade, it would seem likely that the use of imported items as a group is not determined so much by supply as by other factors such as affordability and exposure to the foods. The demand for items that can be locally produced, such as fresh fish and vegetables, appears to be high despite the West Indian predilection for foreign foods (McIntosh, 1978) and the commercial pressure to buy imports. Although fresh fish and vegetables were perceived by many respondents to be somewhat unavailable, rice (an imported item) was described by several respondents as "scarce at times." Thus, despite the stigma of the lack of availability that seems associated with local foods such as

fresh fish and vegetables, perceived availability may affect the consumption of some primary import items in the diet as well.

#### 5. Food beliefs and practices

Insight into the role of ideology -eg, ideas and beliefs - in the shaping of Antiguan food habits was obtained from the answers to two survey questions: "If you had more money to spend on food only, what foods would you buy and why?" and "Are there any foods that individuals in your household avoid or don't eat ... and why?" Responses to the question about foods avoided in the household revealed three major types of food avoidances: the religious avoidance of pork (promulgated by the Rastafarians, a religious group) and of shellfish, crustaceans and other fish without scales (the practice of Seventh Day Adventists on the island); the dislike of fungee and other foods interpreted by the investigator as "traditional" dietary items and other miscellaneous food avoidances motivated by personal taste and/or health concerns. The major health-related avoidance involved the consumption of local animals that are raised in uncontrolled conditions and thus perceived as "unclean." By contrast, slightly more than half of the total number of foods listed

as desirable extra purchases were associated with health-related food concepts. Emphasis (by frequency of answers) was placed on non-starchy vegetables, due in part to the influence of health authorities (eg, "doctor's advice.") The idea of "protecting the body from starch" (substituting for starchy meal items) was exclusively associated with cabbage, carrot and other non-starchy vegetables. This implies that health authorities have succeeded to some extent in informing the public about the concerns of, and alternatives to, a starch-based diet. Other extra food purchases listed included the meat and dairy group for health-related and preference reasons, rice for reasons of preference, availability and need, and starches (including bread and spaghetti) because they are liked. Significantly, cost-related reasons for choosing foods, such as "its available with more money," were only associated with rice (one respondent), canned peas and carrots, flour, macaroni and mayonnaise - all imported items.

When respondents were asked to rank, on a scale of 1 to 7, their perceptions of the expense or availability of selected items, results showed that imported items such as canned fish, canned vegetables and saltfish were perceived as expensive, but available. However, fresh fish and fresh

vegetables, which can be locally produced, were perceived to be somewhat less available and perceptions of the expense of each differed greatly. Respondents from households that fished appeared to perceive fresh fish as relatively less expensive, while residents of households that were growing crops and/or living in the villages appeared to perceived fresh vegetables as relatively less expensive.

When requested to rank, also on a 7-point scale, the importance of selected concepts when buying or growing food, most respondents felt that "family likes the food" was an important concept. "Its good for you," "the cost of the food" and "easy to prepare" were of next greatest importance when purchasing food as judged by the number of respondents giving the concepts a high rank (= 6 or 7). Most respondents also felt that a crop that was "easy to grow," the "cost of growing food compared to the market price for the food" and the "price you get for the food when you sell it" were important concepts when growing or raising food. Thus, family likes and dislikes seem to be as important as economic and health considerations when buying or growing food.

TABLE 1: AGE AND SEX OF RESPONDENTS

<u>AGE</u>	<u>% MALE</u>	<u>% FEMALE</u>	<u>% OF TOTAL SAMPLE</u>
UNKNOWN	10.5	89.5	6.2
13 TO 20	29.8	70.2	15.4
21 TO 35	15.5	84.5	33.8
36 TO 50	23.3	76.7	14.1
50 TO 96	30.1	69.9	30.5

TABLE 2: EDUCATION OF RESPONDENTS

<u>LEVEL ATTAINED</u>	<u>PERCENT OF SAMPLE</u>
UNKNOWN	11.2
SOME PRIMARY	24.6
PRIMARY COMPLETED*	30.5
SOME SECONDARY	6.2
SECONDARY COMPLETED**	22.3
SOME COLLEGE	1.6
COLLEGE COMPLETED	3.6

\* Approximately equivalent to U.S. grades 1 through 9

\*\* Approximately equivalent to U.S. high school



TABLE 3: RESPONDENT'S STATUS IN THE HOUSEHOLD

<u>POSITION IN HOUSEHOLD</u>	<u>PERCENT OF SAMPLE</u>
MOTHER	43.3
DAUGHTER	14.8
LIVES ALONE	13.4
OTHER FEMALE RELATIVE	5.2
FATHER	4.9
WIFE	4.3
SON	4.3
SISTER	2.3
HUSBAND	2.0
BOYFRIEND	1.3
BROTHER	1.3
GIRLFRIEND	1.0
OTHER RELATIVE OR FRIEND	1.9

TABLE 4: NUMBER OF SELF-SUPPORTING  
RESPONDENTS FROM HOUSEHOLDS  
WHERE RESPONDENT LIVES ALONE

<u>RESPONDENT'S STATUS</u>	<u>RELATIONSHIP OF CHIEF WAGE EARNER TO RESPONDENT (FREQUENCY)</u>		
	<u>MYSELF</u>	<u>OTHER</u>	<u>TOTAL</u>
LIVES ALONE	34	6	40
LIVES WITH OTHERS	75	181	256

TABLE 5: AGE AND SEX OF THE CHIEF WAGE EARNER

<u>AGE</u>	<u>PERCENT</u>
17 TO 20	2.0
21 TO 35	23.6
36 TO 60	32.4
OVER 60	11.5
UNKNOWN	30.5
<u>SEX</u>	
MALE	63.3
FEMALE	30.2
BOTH*	2.9
UNKNOWN	3.6

\* more than one chief wage earner listed by respondent

TABLE 6: EDUCATION ATTAINED BY THE CHIEF WAGE EARNER

<u>LEVEL ATTAINED</u>	<u>SEX (%)</u>	
	<u>MALE</u>	<u>FEMALE</u>
SOME PRIMARY	27.1	25.0
PRIMARY COMPLETED*	37.8	33.3
SOME SECONDARY	3.6	5.6
SECONDARY COMPLETED**	24.3	31.9
SOME COLLEGE	4.3	1.4
COLLEGE COMPLETED	2.9	2.8

\* Approximately equivalent to U.S. grades 1 through 9

\*\* Approximately equivalent to U.S. high school

TABLE 7: RELATIONSHIP OF THE CHIEF  
WAGE EARNER TO THE RESPONDENT

<u>RELATIONSHIP</u>	<u>PERCENT OF SAMPLE</u>
MYSELF	35.7
HUSBAND	15.4
BOYFRIEND	10.5
FATHER	9.8
MOTHER	4.6
BROTHER	3.3
SON	3.3
CHILDREN	2.7
SISTER	2.6
DAUGHTER	2.3
OTHER RELATIVE (S)	4.8
OTHER FRIEND(S)	1.9
UNKNOWN	3.0

TABLE 8: OCCUPATIONAL LEVEL  
OF THE CHIEF WAGE EARNER

	<u>OCCUPATION LEVEL*</u>				
	<u>UNKNOWN</u>	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(4)</u>
PERCENT OF TOTAL	10.1	30.2	36.4	20.0	3.3
PERCENT OF MALE	-	31.0	42.8	24.1	2.1
PERCENT OF FEMALE	-	39.5	36.0	17.4	7.1

\* 1 = low-income, 2 = medium-income, 3 = white collar,  
4 = professional

TABLE 9: SPEARMAN RANK CORRELATION OF  
EDUCATION WITH OCCUPATIONAL LEVEL

	(1)	(2)
1-EDUCATION ATTAINED	1.000	-
2-OCCUPATION LEVEL	0.683	1.000

TABLE 10: RESIDENCE OF THE CHIEF  
WAGE EARNER

<u>SURVEY ZONE</u>	<u>FREQUENCY</u>			<u>TOTAL</u>
	<u>HOME</u>	<u>AWAY</u>	<u>UNKNOWN</u>	
CITY 1	8	1	0	9
" 2	14	0	0	14
" 3	14	2	0	16
" 4	15	0	0	15
" 5	16	1	0	17
" 6	14	4	0	18
" 7	18	2	2	22
" 8	11	0	0	11
" 9	10	2	1	13
" 10	19	1	1	21
JENNINGS/EBENEZER	26	3	0	29
BENDALS	8	3	0	11
BOLANS	24	12	0	36
CRABSHILL	13	2	0	15
JOHNSON'S POINT	13	2	1	16
URLINGS	17	1	0	18
OLD ROAD	19	1	4	24
TOTAL	259	37	9	305
% SAMPLE	85	12	3	100

TABLE 11: HOUSEHOLD SIZE

NUMBER OF MEMBERS	FREQUENCY		TOTAL
	CITY	VILLAGE	
1	33	4	37
2	17	13	30
3	31	21	52
4	27	17	44
5	14	23	37
6	14	24	38
7	5	15	20
8	7	11	18
9	2	15	17
10	3	3	6
11	2	4	6

- \* (1) = prepare the food.  
 (2) = social visit. (3) = buy.  
 (3) = purchase the food.

TABLE 12: HOUSEHOLD MEMBERS WHO DECIDE WHICH FOODS TO BUY, WHO PURCHASE AND WHO PREPARE FOOD FOR THE HOUSEHOLD - RELATIONSHIP TO THE RESPONDENT

<u>RELATIONSHIP TO RESPONDENT</u>	<u>PERCENT*</u>		
	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>
MYSELF	53.4	56.1	50.8
MOTHER	7.5	14.1	14.1
WIFE	2.6	3.9	3.3
FATHER	0.3	0.3	1.9
HUSBAND	0	1.0	2.6
SISTER	0	1.0	1.0
BROTHER	0	0	0.3
DAUGHTER	0.7	0	0
OLDER CHILD	3.3	3.3	5.9
GIRL FRIEND	2.0	2.0	2.6
BOYFRIEND	0	0.3	0.7
MOTHER-IN-LAW	0.7	0.7	1.0
GRANDMOTHER	0.7	0.7	0.7
RESPONDENT, MOTHER	5.9	3.6	1.3
RESPONDENT, OTHER FEMALE RELATIVE(S)	4.2	3.0	0.9
RESPONDENT, OTHER MALE RELATIVE(S)	2.7	0.7	1.0
RESPONDENT, OLDER CHILD CHILDREN	3.3	1.0	1.0
CHILDREN	0	0.3	0.3
OTHER FEMALE RELATIVE(S)	4.1	3.0	2.7
OTHER MALE RELATIVE(S)	0	0	0.3
FAMILY MEMBER(S) AND/OR MAID	1.0	0.3	0.9
FAMILY MEMBER(S), FRIEND	2.0	1.4	0.3
OTHER	5.6	3.3	5.8
UNKNOWN	0	0	0.6

- \* (1) = prepare the food,  
 (2) = decide which foods to buy  
 (3) = purchase the food

TABLE 13: SOURCE OF NUTRITION EDUCATION OF THE  
125 FOOD PREPARERS RECEIVING SUCH EDUCATION

<u>SOURCE</u>	<u>NUMBER*</u>	<u>%</u>
GENERAL EDUCATION	98	78.4
ADULT EDUCATION	9	7.2
RADIO	22	17.6
TELEVISION	22	17.6
NURSING SCHOOL	1	0.8

\* Individuals may have received instruction  
from more than one source

TABLE 14: SIZE AND OWNERSHIP OF RESPONDENT'S HOUSE

<u>NUMBER OF ROOMS</u>	<u>FREQUENCY OF HOUSES</u>	
	<u>RENTED</u>	<u>OWNED</u>
1	9	5
2	16	26
3	5	14
4	9	48
5	12	50
6	8	43
7	3	28
8	3	9
9	0	6
10	0	4
11	0	0
12	0	1
13	0	0
14	0	1
	TOTAL = 65	235
	MISSING CASES = 5	

TABLE 15: HOUSEHOLD WEALTH FACTORS+

<u>"BASIC"</u>		<u>"LUXURY"</u>	
*0.78	ELECTRIC IRON	*0.68	CLOTHES WASHER
*0.74	TV (BLACK AND WHITE)	*0.64	CLOTHES DRYER
*0.73	REFRIGERATOR	*0.61	TV (COLOR)
*0.72	GAS STOVE	*0.53	SEWING MACHINE
*0.52	RADIO	*0.50	ELECTRIC FAN
*0.43	TOILET	*0.42	PHONE
*0.41	STEREO	0.38	STEREO
0.33	SEWING MACHINE	0.29	TOILET
0.32	PHONE	-0.25	LATRINE

+ From factor analysis of 20 pre-selected household items using principle components extraction, varimax rotation, eigenvalue cut-off = 1.0. All variables with factor loadings less than 0.25 excluded.

\* Variables with loadings considered significant.



TABLE 16: OWNERSHIP OF SELECTED HOUSEHOLD ITEMS

<u>ITEM</u>	<u>% OF HOUSEHOLDS</u>	
	<u>OWNING</u>	<u>NOT OWNING</u>
REFRIGERATOR	62.6	37.4
COAL POT	77.7	22.3
GAS STOVE	64.9	35.1
CAR	20.0	80.0
BICYCLE	10.5	89.5
TRUCK	2.0	98.0
BUS	1.0	99.0
WATER SUPPLY	94.0	6.0
SEWERAGE	88.0	12.0
TELEPHONE	50.0	50.0
TELEVISION	10.0	90.0
REFRIGERATOR	62.6	37.4
COAL POT	77.7	22.3
GAS STOVE	64.9	35.1
CAR	20.0	80.0
BICYCLE	10.5	89.5
TRUCK	2.0	98.0
BUS	1.0	99.0
WATER SUPPLY	94.0	6.0
SEWERAGE	88.0	12.0
TELEPHONE	50.0	50.0
TELEVISION	10.0	90.0
REFRIGERATOR	62.6	37.4
COAL POT	77.7	22.3
GAS STOVE	64.9	35.1
CAR	20.0	80.0
BICYCLE	10.5	89.5
TRUCK	2.0	98.0
BUS	1.0	99.0

TABLE 17: TYPE OF HOUSEHOLD WATER SUPPLY

<u>WATER SUPPLY</u>	<u>% HOUSEHOLDS</u>
STANDARD PIPE	58.7
RAIN WATER	42.0
RUNNING WATER	39.3
RAIN WATER & RUNNING WATER	23.6
RAIN WATER & STANDARD PIPE	15.7
STANDARD PIPE & RUNNING WATER	1.6

TABLE 18: WATER SUPPLY BY SURVEY ZONE

<u>SURVEY ZONE</u>	<u>RUNNING WATER</u>	<u>STANDARD PIPE</u>	<u>RAIN WATER</u>
CITY 1	44.4	55.6	33.3
" 2	64.3	35.7	28.6
" 3	50.0	43.7	18.7
" 4	8.9	66.7	20.0
" 5	0.0	100.0	5.5
" 6	16.7	72.2	16.7
" 7	23.8	66.7	47.6
" 8	81.8	18.2	45.4
" 9	58.3	41.7	41.7
" 10	28.6	76.2	23.8
JENNINGS/EBENEZER	69.0	27.6	69.0
BENDALS	0.0	100.0	0.0
BOLANS	19.4	77.8	36.1
CRABSHILL	40.0	53.3	86.7
JOHNSONS POINT	50.0	50.0	56.2
URLINGS	33.3	61.1	88.9
OLD ROAD	66.7	41.7	62.5

TABLE 19: MEASURES OF COSMOPOLITENESS  
(DEGREE OF EXPOSURE TO NEW IDEAS)  
OF RESPONDENT AND HOUSEHOLD

EXTENT OF TRAVEL BY RESPONDENT OR HOUSEHOLD MEMBER

<u>FARTHEST PLACE TRAVELED</u>	<u>% SAMPLE</u>
NO TRAVEL	55.4
EASTERN CARIBBEAN	27.2
GREATER CARIBBEAN	2.0
U.S./CANADA	10.2
EUROPE	5.2

RESPONDENTS WITH RELATIVES OVERSEAS

<u>STATUS OF RELATIVES</u>	
NONE/HAVE RELATIVES, BUT DO NOT COMMUNICATE	13.8
HAVE RELATIVES, SOMETIMES COMMUNICATE	34.7
HAVE RELATIVES, COMMUNICATE OFTEN	51.5

RESPONDENTS WITH FRIEND FROM OVERSEAS

HAVE FRIEND	39.7
NO FRIEND	60.3

TABLE 19: CONTINUED

RESPONDENT'S NEWS PREFERENCELEVEL OF NEWS  
PREFERRED% SAMPLE

LOCAL	14.1
INTERNATIONAL	4.9
BOTH	77.4
UNKNOWN	3.6

TYPE OF NEWSPAPER READ BY RESPONDENTTYPE  
OF PAPER

DO NOT READ	51.1
LOCAL	38.7
REGIONAL	0.4
INTERNATIONAL	9.8

TABLE 20: FREQUENCY OF FOOD PURCHASE

<u>FREQUENCY</u>	<u>% SAMPLE</u>
UNKNOWN	1.3
EVERY DAY	17.0
4 TO 6 TIMES PER WEEK	2.3
1 TO 3 TIMES PER WEEK	75.1
TWICE PER MONTH	1.0
ONCE PER MONTH	2.6
WHEN HAVE MONEY	0.3
DO NOT PURCHASE	0.3

TABLE 21: EFFECT OF HOUSEHOLD FOOD PRODUCTION ON DAILY SHOPPING

<u>HOUSEHOLD FOOD PRODUCTION</u>	<u>PERCENT SHOPPING DAILY</u>
PRODUCE MILK:	
NO	96.2
YES	3.8
FISH:	
NO	90.0
YES	10.0
PRODUCE EGGS:	
NO	71.1
YES	28.9
RAISE CROPS:	
NO	46.2
YES	53.8

TABLE 22: EFFECT OF HOUSEHOLD OWNERSHIP  
OF REFRIGERATOR ON FREQUENCY OF FOOD PURCHASE

<u>SHOPPING FREQUENCY</u>	<u>PERCENT WITH OR WITHOUT REFRIGERATOR</u>	
	<u>NO</u>	<u>YES</u>
DAILY	48.1	51.9
4 TO 6 TIMES PER WEEK	57.1	42.9
1 TO 3 TIMES PER WEEK	34.1	65.9

TABLE 23: LOCATION OF FOOD PURCHASE

<u>LOCATION</u>	<u>% SAMPLE</u>
LOCAL SHOP	73.8
OPEN MARKET	60.3
SUPERMARKET	73.8
SUPERMARKET & LOCAL SHOP	50.5
SUPERMARKET, OPEN MARKET & LOCAL SHOP	33.4

TABLE 24: VEGETABLE PURCHASING PATTERNS

TYPE OF PRODUCT	<u>% RESPONDENTS PURCHASING</u>	
	<u>DURING GROWING SEASON</u>	<u>DURING OFF-SEASON</u>
FRESH	68.5	63.3
FROZEN	0.3	1.0
CANNED	0.3	1.6
FRESH & FROZEN	1.3	2.0
FRESH & CANNED	16.2	17.4
FROZEN & CANNED	0.3	1.0
ALL 3	2.3	3.9
UNKNOWN	10.8	9.8

TABLE 25: CROP PRODUCTION: PLOT TYPE AND LOCATION

<u>TYPE</u>	<u>% HOUSEHOLDS</u>		
	<u>CITY</u>	<u>VILLAGE</u>	<u>TOTAL</u>
BACKYARD	40.6	49.3	44.9
GROUND	1.9	18.0	9.8
BOTH	1.3	17.3	9.2
<hr/>			
TOTAL WITH PLOT	43.8	84.6	

TABLE 26: CROPS GROWN BY HOUSEHOLDS

<u>CATEGORY</u>	<u>CROP</u>	<u>% OF TOTAL CROP GROWERS PRODUCING THE CROP</u>
	<u>INDIVIDUAL</u>	
FRUITS		85.2
	MANGO	31.6
	COCONUT	28.6
	PAPAYA	24.5
	SOURSOP	21.4
	LIMES	18.9
	SUGARAPPLE	17.3
	BANANAS	17.3
	ORANGES	15.3
	FIGS	13.3
	GUAVA	11.2
	AVOCADOES	8.2
	LEMONS	7.6
	PLUM	5.6
	GRAPEFRUIT	4.1
	TANGERINE	3.6
	SORREL	3.6



TABLE 26: CONTINUED

<u>CATEGORY</u>	<u>CROP</u> <u>INDIVIDUAL</u>	<u>% OF TOTAL CROP GROWERS</u> <u>PRODUCING THE CROP</u>
FRUITS		
	GUINEPS	3.1
	POMEGRANATE	2.6
	BERRIES	2.6
	DUMES	2.0
	FINGER ROSE*	2.0
	PINEAPPLE	1.5
	GRAPES	1.0
	PASSION FRUIT	1.0
	MELON	0.5
	CUSTARD APPLE	0.5
	GOLDEN APPLE	0.5
STARCHY ROOTS & TUBERS		
		46.4
	SWEET POTATO	31.6
	CASSAVA	29.1
	YAMS	11.7
	EDDOES	9.2
	PLAINTAIN	2.6
	BREADFRUIT	2.0
	DASHEEN	0.5
	BUGAMENT	0.5
GREEN VEGETABLES		
		39.3
	OKRA	19.4
	CABBAGE	11.2
	SPINACH	10.2
	SWEET PEPPER	7.6
	CUCUMBER	4.6
	LETTUCE	3.1
	EDDO TOPS	2.6
	STRING BEANS	1.0

TABLE 26: CONTINUED

<u>CATEGORY</u>	<u>CROP</u> <u>INDIVIDUAL</u>	<u>% OF TOTAL CROP GROWERS</u> <u>PRODUCING THE CROP</u>
MISC.		
VEGETABLES		30.1
	EGGPLANT	27.6
	BEETS	3.6
	ONION	1.5
	RADISH	0.5
	TURNIPS	0.5
	CASSIE	0.5
SUGARCANE		24.5
YELLOW		
VEGETABLES		20.4
	PUMPKIN	7.1
	TOMATO	6.1
	SQUASH	5.6
	CARROT	4.1
	CORN	3.1
LEGUMES		19.9
	RED BEAN PEAS	17.9
	PIGEON PEAS	2.0
	LENTILS	0.5
MISC.		
CROPS		10.2
	GINGER	5.1
	HOT PEPPER	3.1
	THYME	1.5
	PARSLEY	0.5
	CHIVE	0.5

\* small banana

TABLE 27: USES OF CROPS NOT CONSUMED

<u>USE</u>	<u>% OF TOTAL CROP GROWERS</u>
SELL & GIVE AWAY	21.9
GIVE AWAY	19.4
SELL	18.4

TABLE 28: ANIMALS RAISED FOR HOUSEHOLD CONSUMPTION

<u>ANIMAL PRODUCT</u>	<u>% OF HOUSEHOLDS</u>		
	<u>CITY</u>	<u>VILLAGE</u>	<u>TOTAL</u>
CATTLE FOR MEAT	0.0	9.3	4.6
CATTLE FOR MILK	3.9	21.3	12.4
CHICKENS FOR MEAT	10.3	16.0	13.1
CHICKENS FOR EGGS	20.6	38.7	29.5
PIGS OR HOGS	1.9	15.3	8.5
GOATS	4.5	15.3	9.8
SHEEP	1.3	15.3	8.2

TABLE 29: RESPONDENTS RAISING ANIMAL PRODUCTS FOR HOUSEHOLD CONSUMPTION

<u>PRODUCT(S)</u>	<u>% OF HOUSEHOLDS RAISING PRODUCT</u>
CATTLE:	
MILK ONLY	64.1
MEAT ONLY	2.6
MILK & MEAT	33.3
CHICKENS:	
EGGS ONLY	55.6
MEAT ONLY	0.0
EGGS & MEAT	44.4

TABLE 30: USES OF ANIMAL PRODUCTS NOT CONSUMED

<u>USE</u>	<u>% OF TOTAL HOUSEHOLDS</u>	
	<u>RAISING ANIMALS</u>	
SELL	77.0	
GIVE AWAY	14.9	
SELL & GIVE AWAY	6.8	
SELL, EXCHANGE & GIVE AWAY	1.3	

TABLE 31: FOOD RESOURCES SCORES

<u>CROP</u> <u>FREQUENCY*</u>		<u>ANIMAL</u> <u>FREQUENCY**</u>		<u>FOOD RESOURCES</u> <u>SCORE***</u>	
<u>SCORE</u>	<u>%</u>	<u>SCORE</u>	<u>%</u>	<u>SCORE</u>	<u>%</u>
0	35.7	0	56.4	0	26.9
1	15.4	1	19.4	1	12.5
2	19.7	2	12.8	2	16.1
3	13.8	3	7.5	3	15.7
4	6.9	4	1.6	4	9.2
5	4.6	5	2.0	5	7.9
6	2.9	7	0.3	6	3.9
7	1.0			7	2.6
				8	2.3
				9	1.6
				10	0.7
				11	0.3
				13	0.3

\* Crop categories: starchy roots & tubers, fruit & fruit trees, green vegetables, yellow vegetables, miscellaneous vegetables, peas and beans, sugarcane

\*\* Animals raised: cattle for meat, cattle for milk, chickens for meat, chickens for eggs, pigs or hogs, goats, sheep

\*\*\* Score = Crop Frequency + Animal Frequency

TABLE 32: COMPARISON OF HOUSEHOLDS EATING VERSUS SELLING  
CROPS ANIMALS OR BOTH

<u>USE OF PRODUCT</u>	<u>FREQ</u>	<u>% OF CROP PRODUCERS</u>	<u>% OF ANIMAL PRODUCERS</u>
SELLING* CROPS	43	40.3	-
EATING** ANIMALS & CROPS	106	54.1	-
SELLING ANIMALS	26	-	46.6
EATING ANIMALS & CROPS	106	-	79.7

\* May also include respondents who eat, exchange  
or give away some of their products

\*\* May also include respondents who exchange or  
give away some of their products

TABLE 33: EFFECT OF HOUSEHOLD FISHING ACTIVITY  
ON RESPONDENTS' FISH CONSUMPTION PATTERNS

FREQUENCY OF CONSUMPTION	FISH PRODUCT/FISHING ACTIVITY, % OF RESPONSES					
	FRESH		SALTED		FROZEN	
	+FISH	NO FISH	FISH	NO FISH	FISH	NO FISH
DO NOT EAT	2.2	6.9	2.3	3.2	63.6	63.6
DAILY	4.4	2.8	2.3	2.1	0.0	0.4
SEVERAL TIMES A WEEK	64.5	52.5	30.2	45.6	25.0	14.2
ONCE A WEEK	8.9	17.1	58.1	40.9	6.9	11.7
MONTHLY*	17.8	17.9	7.1	7.9	4.5	8.1
RARELY**	2.2	2.8	0.0	2.1	0.0	2.0
TOTAL =	100	100	100	100	100	100

\* Once to several times a month

\*\* Several times a year, not often, rarely, seldom, seasonally

+ "Fish" represents respondents from households that caught their own fish; "No Fish" represents respondents from households that did not catch their own fish

TABLE 33: CONTINUED

FREQUENCY OF CONSUMPTION	FISH PRODUCT/FISHING ACTIVITY, % OF RESPONSES					
	CANNED		PICKLED		SMOKED	
	FISH	NO FISH	FISH	NO FISH	FISH	NO FISH
DO NOT EAT	35.6	28.6	46.6	39.8	61.4	54.2
DAILY	0.0	1.2	0.0	0.4	0.0	0.0
SEVERAL TIMES A WEEK	22.2	19.4	11.7	6.8	6.8	2.0
ONCE A WEEK	17.8	23.8	13.9	14.9	4.5	10.4
MONTHLY*	20.0	24.6	13.9	20.8	15.9	16.5
RARELY**	4.4	2.4	13.9	17.3	11.4	16.9
TOTAL =	100	100	100	100	100	100

\* Once to several times a month

\*\* Several times a year, not often, rarely, seldom,  
seasonally

(1) mackerel or shad

(2) herring

TABLE 34: CONSUMPTION OF SELECTED FRUIT  
AND VEGETABLE GROUPS BY RESPONDENTS

% OF RESPONDENTS CONSUMING SELECTED  
FRUITS AND VEGETABLES

<u>FREQUENCY OF CONSUMPTION</u>	<u>FOOD GROUP</u>	
	<u>DARK GREEN LEAFY VEGETABLES</u>	<u>STARCHY ROOTS &amp; TUBERS</u>
DO NOT EAT	0.3	1.3
DAILY	13.4	6.9
WEEKLY*	62.4	53.1
ONCE A WEEK	16.7	29.5
MONTHLY**	6.6	6.9
RARELY***	0.3	1.3
UNKNOWN	0.3	1.0

<u>FREQUENCY OF CONSUMPTION</u>	<u>FOOD GROUP</u>	
	<u>CANNED VEGETABLES</u>	<u>FRESH FRUITS</u>
DO NOT EAT	13.8	0.7
DAILY	2.9	39.0
WEEKLY*	21.3	37.0
ONCE A WEEK	45.9	16.4
MONTHLY**	10.8	3.9
RARELY***	3.3	2.0
UNKNOWN	2.0	1.0

\* Several times a week

\*\* Once to several times a month

\*\*\* Several times a year, not often, rarely, seldom,  
seasonally



TABLE 35: CONSUMPTION OF SELECTED FISH PRODUCTS  
BY RESPONDENTS

FREQUENCY OF CONSUMPTION	% OF RESPONDENTS CONSUMING PRODUCT		
	FRESH	SALTED	CANNED
DO NOT EAT	5.9	3.3	29.6
DAILY	2.9	1.3	1.0
WEEKLY*	53.1	42.1	19.4
ONCE A WEEK	15.4	43.1	23.7
MONTHLY**	17.5	8.2	23.3
RARELY***	2.6	1.0	2.7
UNKNOWN	2.6	1.0	0.3

FREQUENCY OF CONSUMPTION	% OF RESPONDENTS CONSUMING PRODUCT		
	FROZEN	PICKLED (1)	SMOKED (2)
DO NOT EAT	62.4	40.6	54.8
DAILY	0.4	0.3	0
WEEKLY*	15.2	7.3	2.6
ONCE A WEEK	11.1	14.9	9.6
MONTHLY**	7.3	19.1	16.2
RARELY***	1.6	16.2	1.0
UNKNOWN	2.0	1.6	15.8

\* Several times a week

\*\* Once to several times a month

\*\*\* Several times a year, not often, rarely, seldom, seasonally

(1) mackerel or shad

(2) herring

TABLE 36: RESPONDENTS DESIRE TO EAT MORE  
OF THE SELECTED FISH PRODUCTS

WANT MORE	<u>% RESPONDENTS</u>					
	<u>FRESH</u>	<u>SALTED</u>	<u>CANNED</u>	<u>FROZEN</u>	<u>PICKLED</u>	<u>SMOKED</u>
YES	83.3	62.9	40.3	32.4	40.3	30.2
NO	15.7	35.4	57.7	63.6	56.4	67.5
UNKNOWN	1.0	1.7	2.0	4.0	3.3	2.3

TABLE 37: CORRELATION MATRIX FROM REGRESSION OF  
FISH CONSUMPTION ON SELECTED VARIABLES

	NO. ROOMS IN HOUSE	"BASIC"*	"LUXURY"*
FRESH FISH CONSUMPTION	-0.035	0.000	0.027
SALTFISH CONSUMPTION	0.022	0.030	0.084

\* The first two of six dimensions produced by a principle components analysis (varimax rotation, eigenvalue cut-off of 1.0) of 20 pre-selected household items marked present or absent in the respondent's house. "Basic" household acquisitions included an electric iron (0.78), black and white TV (0.74), refrigerator (0.73), gas stove (0.72), radio (0.52), toilet (0.43), stereo (0.41). "Luxury" acquisitions included a clothes washer (0.68), clothes dryer (0.64), color TV (0.61), sewing machine (0.53), electric fan (0.50), phone (0.42). Individual factor scores on these dimensions were used as variable measures.

TABLE 38: FREQUENCY OF CONSUMPTION OF SELECTED FOODS  
AMONG SUBSAMPLE RESPONDENTS, N = 28

PART A.

<u>FOOD</u>	<u>NUMBER OF RESPONDENTS CONSUMING THE FOOD</u>		
	<u>DO NOT EAT</u>	<u>YEARLY</u>	<u>MONTHLY</u>
BEEF	-	-	-
-IMPORTED SALT	8	4	7
-LOCAL	-	-	1
-IMPORTED FRESH	18	1	1
CHICKEN	2	-	2
SHEEP	13	3	7
GOAT	5	3	11
PORK	5	6	5
LOBSTER	15	8	4
CONCH	11	9	4
CRAB	21	4	2
EGG	1	-	-
MILK	-	-	-
-CANNED	-	-	-
-FRESH	14	-	2
-DRIED	16	-	3
RICE	-	-	-
PLAINTAIN	3	-	1
FUNGEE	3	-	3
DUMPLINGS	3	-	6
BREAD	-	-	-
PEAS	-	-	-
OR BEANS	1	-	1
PEANUTS OR GROUND NUTS	5	-	1
YELLOW	-	-	-
VEGETABLES	1	-	1
CANNED	-	-	-
FRUIT JUICE	3	-	4
CANNED	-	-	-
FRUIT	8	2	9
IMPORTED	-	-	-
FRESH FRUIT	3	1	6
SOFT DRINKS	5	1	1
DESSERT	2	1	1
VITS OR OVALTINE	-	-	-

TABLE 38: CONTINUED

FOOD	# TIMES CONSUMED PER WEEK (NUMBER OF RESPONDENTS)							NA
	1	2	3	4	5	6	7	
BEEF	16	10	1	-	1	-	-	-
- IMPORTED SALT	8	-	1	-	-	-	-	-
- LOCAL	18	8	-	-	1	-	-	-
- IMPORTED FRESH	4	3	-	-	-	-	-	1
CHICKEN	3	12	3	2	2	1	1	-
SHEEP	4	1	-	-	-	-	-	-
GOAT	6	2	1	-	-	-	-	-
PORK	7	3	1	-	-	-	-	1
LOBSTER	-	-	1	-	-	-	-	-
CONCH	4	-	-	-	-	-	-	-
CRAB	-	-	-	-	-	-	-	1
EGG	1	6	9	2	3	-	6	-
MILK	-	-	-	1	-	1	26	-
- CANNED	-	-	-	2	-	1	25	-
- FRESH	1	1	-	-	-	-	7	3
- DRIED	2	-	-	-	1	-	4	2
RICE	3	9	20	3	2	1	-	-
PLAINTAIN	9	10	5	-	-	-	-	-
FUNGEE	15	5	-	2	-	-	-	-
DUMPLINGS	15	3	-	1	-	-	-	-
BREAD	-	-	2	1	-	1	24	-
PEAS	-	-	-	-	-	-	-	-
OR BEANS	9	8	3	1	1	-	4	-
PEANUTS OR GROUND NUTS	11	7	-	-	-	-	4	-
YELLOW	-	-	-	-	-	-	-	-
VEGETABLES	2	11	4	4	1	-	4	-
CANNED	-	-	-	-	-	-	-	-
FRUIT JUICE	4	5	4	1	-	-	6	1
CANNED	-	-	-	-	-	-	-	-
FRUIT	7	1	1	-	-	-	1	-
IMPORTED	-	-	-	-	-	-	-	-
FRESH FRUIT	6	7	3	-	-	-	1	1
SOFT DRINKS	3	4	4	-	2	1	7	-
DESSERT	9	7	2	-	-	-	6	-
VITS OR OVALTINE	1	2	2	2	-	-	21	-

TABLE 39: 24-HOUR RECALL INTAKES: FREQUENCIES  
OF FOODS CONSUMED, N = 305

<u>FOOD GROUP</u>	<u>NO. RESPONDENTS CONSUMING THE FOOD</u>
1. MEAT DISHES	
A. MEATS:	
BEEF	51
PORK	61
EGG	81
MUTTON	11
FOWL	100
FISH: SALTED	62
FRESH	47
PICKLED	8
SARDINE	4
B. MIXED MEAT DISHES OR FABRICATED MEATS:	
MEAT + VEGETABLES	61
MEAT + RICE OR PASTA	20
MEAT SOUP	13
MEAT PIE, PIZZA, CHICKEN FRANKS, MISC.	11
TOTAL (1) =	530
2. BREAD DISHES (EXCLUDING BREAD AND BUTTER)	
BREAD = CHEESE (BUTTER OPTL.)	67
BREAD = MEAT (S)	65
TOTAL (2) =	132
3. STARCH DISHES	
BREAD, BUTTER	170
RICE	51
MACARONI & CHEESE OR PASTA	45
TOAST, BISCUITS, BUN, CRACKERS, FRITTER	37
FUNGEE	34
DUMPLING	26
TOTAL (3) =	363

TABLE 39: CONTINUED

<u>FOOD GROUP</u>	<u>NO. RESPONDENTS CONSUMING THE FOOD</u>
4. VEGETABLES	
RICE & VEGETABLES	28
CABBAGE	26
TOMATO	22
EGGPLANT/OKRA	21
CARROT	18
OTHER VEGETABLES	93
	TOTAL (4) = 208
5. STARCHY ROOT CROPS	
WHITE POTATOES	35
SWEET POTATO	20
PLAINTAIN	17
YAM	7
CASSAVA, BUGAMENT	7
PUMPKIN	5
DASHEEN	2
BREADFRUIT	2
	TOTAL (5) = 95
6. FRUITS	
BANANA	26
PAPAW (PAPAYA)	14
OTHER FRUITS	13
	TOTAL (6) = 53
7. BEVERAGES	
TEA (W/MILK OR SUGAR)	87
"JUICE" (MIXED FRUIT DRINKS) & OTHER FRUIT DRINKS	78
CITRUS FRUIT JUICES	63
LOCAL FRUIT DRINKS (SORREL, SOURSOP, PASSION FRUIT, WATERMELON, ETC)	31
MALT	29
COFFEE	25
WATER	24
"SODA"	24
OTHERS	19
	TOTAL (7) = 381

TABLE 39: CONTINUED

<u>FOOD GROUP</u>	<u>NO. RESPONDENTS CONSUMING THE FOOD</u>
8. MILK	
PLAIN	57
CHOCOLATE	44
	TOTAL (8) = 101
9. LEGUME DISHES	
RICE & BEANS	52
PEAS OR BEANS	12
	TOTAL (9) = 64
10. CEREALS	
OATS	17
CREAM OF WHEAT	16
OTHER CEREALS	18
	TOTAL (10) = 51
11. DESSERTS/SNACKS	
NUTS	5
CAKE	28
OTHER SWEETS	19
OTHER SNACKS	10
	TOTAL (11) = 62
12. VITAMIN SUPPLEMENTS	
OVALTINE	50
MILO	32
COMPLAN	1
	TOTAL (12) = 83
13. ALCOHOL	
BEER	8
WINE	7
LIQUOR	6
	TOTAL (13) = 21
	TOTAL FOODS = 2144

TABLE 40: 24-HOUR RECALL INTAKES:  
FACTOR ANALYSIS OF FOODS CONSUMED\*

FACTOR 1

0.78 SUGAR  
0.78 MILK  
0.55 CREAM OF WHEAT  
0.48 OATS

FACTOR 2

0.67 CABBAGE  
0.61 CARROT  
0.39 OVALTINE  
0.35 TOMATO  
0.35 SORREL DRINK  
0.33 BEEF & VEGETABLES  
0.29 EGG  
0.27 SWEET POTATO  
0.26 MACARONI & CHEESE

FACTOR 3

0.55 SALT FISH  
0.46 PAPA W (PAPAYA)  
0.41 POTATO SALAD  
0.40 LEMONADE  
0.39 CHOCOLATE MILK  
0.36 DUMPLING  
0.30 EGGPLANT/OKRA  
0.30 BANANA  
0.27 WATER  
0.27 YAM  
0.26 BREAD & SARDINE

FACTOR 4

0.54 FUNGEE  
0.50 BUTTER  
0.44 "VEGETABLE"  
0.40 SALT FISH  
0.38 BREAD & LUNCHEON MEAT  
0.36 BREAD & SAUSAGE OR BACON  
0.29 EGGPLANT/OKRA

FACTOR 5

0.51 MILO  
0.51 BREAD  
0.45 EGG  
0.40 "FISH"  
0.35 PLAIN TAIN  
0.31 PORK

FACTOR 6

0.41 BEEF  
0.33 SALT FISH  
0.29 MIXED VEGETABLES  
0.29 CUCUMBER  
0.27 EGGPLANT/OKRA  
0.27 WHITE POTATOES  
0.27 COFFEE  
0.26 BREAD

\* Variables = 77 (foods with mean < 2.0 excluded), principle components extraction, varimax rotation, eigenvalue cut-off = 2.0. All variables with factor loadings < 0.025 excluded.



TABLE 41: 24-HOUR RECALL INTAKES:  
MEAL PATTERN ANALYSIS

A. PRIMARY, SECONDARY AND PERIPHERAL  
FOODS AT EACH MEALTIME

1. AM FOOD PATTERNS, N = 290

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>MEATS</u> NO.* = 168 TYPES** = 17 INDIV+ = 129	EGG (77)	PORK (30) SALTFISH (22)	SAUSAGE OR BACON (8) BEEF (6) CHICKEN (4) FISH & VEGS (4) SARDINE (3) HAMROLL (3) PIG FEET (3)
<u>STARCHES</u> NO. = 153 TYPES = 9 INDIV = 146	BREAD W/BUTTER (135)	-	TOAST (5) BISCUITS (3) CRACKERS (3) RICE (3)
<u>BREADS</u> NO. = 86 TYPES = 11 INDIV = 86	BREAD & CHEESE (37)	BREAD & SAUSAGE (17)	BREAD + EGG + CUCUMBER (8) BREAD + SARDINE (9) BREAD + MEAT (4) BREAD + SAUSAGE + EGG (3) BREAD + EGG + BACON (3)
<u>VEGETABLES</u> NO. = 52 TYPES = 9 INDIV = 41	TOMATO (16) CUCUMBER (14) EGGPLANT OR OKRA (12)	-	"VEGETABLES" (4)
<u>FRUITS</u> NO. = 28 TYPES = 8 INDIV = 23	BANANA (14)		ORANGE (5) PAPAYA (4)

TABLE 41: CONTINUED

## 1. AM FOOD PATTEENS, CONTINUED

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>CEREALS</u> NO. = 35 TYPES = 5 INDIV = 35	CREAM OF WHEAT (11) OATS (2)	"CEREAL" (3) CORN FLOUR CEREAL (5)	CORNFLAKES (4)
<u>MILK</u> NO. = 78 INDIV = 76	PLAIN (37) CHOCOLATE (41)	-	-
<u>BEVERAGES</u> NO. = 161 TYPES = 17 INDIV = 152	TEA {MILK AND SUGAR} (75)	COFFEE (23) "JUICE" (17) ORANGE JUICE (16)	LEMONADE (5) WATER (7) SODA (7)

## 2. NOON FOOD PATTERNS, N = 241

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>MEATS</u> NO. = 201 TYPES = 31 INDIV = 175	CHICKEN (55)	SALTFISH (19) BEEF (18) FRESH FISH (15) CHICKEN & VEGS (15)	PORK (6) FISH & VEGS (7) CHICKEN & RICE (6) CHICKEN VEG SOUP (7)
<u>LEGUMES</u> NO. = 36 TYPES = 3 INDIV = 36	RICE & BEANS (30)	PEAS (5)	BEANS (1)
<u>STARCHES</u> NO. = 110 TYPES = 11 INDIV = 101	RICE (27) BREAD & BUTTER (24)	FUNGEE (14) DUMPLING (11) MACARONI (10) MACARONI & CHEESE (9)	BISCUITS (7) BUN (6)
<u>BREADS</u> NO. = 34 TYPES = 7 INDIV = 34	BREAD & CHEESE (17)	BREAD + SAUSAGE (10)	BREAD + SARDINE (3) BREAD + MACKEREL (2)

TABLE 41: CONTINUED

## 2. NOON FOOD PATTERNS, CONTINUED

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>VEGETABLES</u>	CABBAGE (13)	- MIXED VEGS (6) -	
NO. = 76	RICE	- VEG SOUP (6) -	
TYPES = 19	& VEGS (12)	- EGGPLANT/OKRA (5) -	
INDIV = 61	CARROT (9)	- TOMATO (4) -	
<u>STARCHY</u>			
<u>ROOT CROPS</u>	SWEET POTATO (8)	- YAM (4) -	
NO. = 42	PLAINTAIN (7)	- MASHED POTATOES (4) -	
TYPES = 10	POTATO		
INDIV = 32	SALAD (6)		
	WHITE		
	POTATOES (5)		
<u>FRUITS</u>	BANANA (5)	PAPAYA (3)	PAPAYA
NO. = 10			SALAD (1)
TYPES = 4			APPLES (1)
INDIV = 10			
<u>CEREALS</u>	CREAM	"CEREAL" (3)	CORNFLAKES (2)
NO. = 15	OF WHEAT (4)	CORN FLOUR	
INDIV = 15	OATS (5)	CEREAL (1)	
TYPES = 5			
<u>BEVERAGES</u>	"JUICE" (40)	MALT (20)	SODA (13)
NO. = 120			ORANGE
TYPES = 16			JUICE (10)
INDIV = 115			WATER (7)
			LIMEADE (6)
			GINGER BEER (5)

TABLE 41: CONTINUED

## 3. PM FOOD PATTERNS, N = 243

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>MEATS</u> NO. = 193 TYPES = 32 INDIV = 180	CHICKEN (40)	SALTFISH (24) FRESH FISH (27) BEEF (15) PORK (11) FISH & VEGS (10) CHICKEN & VEGS (9)	MUTTON (6) CHICKEN VEG SOUP (6) PICKLED MACKEREL (5) PIG FEET (4)
<u>LEGUMES</u> NO. = 26 TYPES = 3 INDIV = 26	RICE & BEANS (21)	- BEANS (1) - - PEAS (4) -	
<u>STARCHES</u> NO. = 129 TYPES = 12 INDIV = 125	BREAD W/BUTTER (32)	RICE (24) MACARONI (22) FUNGEE (18) DUMPLING (14)	BISCUITS (5) MACARONI & CHEESE (5) PANCAKE FRITTER (4)
<u>BREADS</u> NO. = 31 TYPES = 6 INDIV = 29	BREAD & CHEESE (16) BREAD & SAUSAGE (10)	- BREAD + EGG + CUC (1) - - BREAD + BEEF + TOMATO (1) - - BREAD + MEAT (3) -	
<u>VEGETABLES</u> NO. = 77 TYPES = 16 INDIV = 63	RICE & VEGS (14) CABBAGE (11)	VEG SOUP (9) CARROT (7) EGGPLANT OR OKRA (6) PEAS & CARROTS (5)	"VEGETABLES" (4) MIXED VEGS (3) LETTUCE (3)

TABLE 41: CONTINUED

## 3. PM FOOD PATTERNS, CONTINUED

	<u>PRIMARY</u>	<u>SECONDARY</u>	<u>PERIPHERAL</u>
<u>STARCHY</u>			
<u>ROOT CROPS</u>	SWEET	POTATO	-
NO. = 47	POTATO (11)	SALAD (5)	
TYPES = 11	PLAINTAIN (9)	MASHED	
INDIV = 37	WHITE	POTATOES (4)	
	POTATOES (7)	CASSAVA	
		/BUGAM ENT (4)	
		YAM (3)	
<u>FRUITS</u>	BANANA (5)	PAPAYA (4)	APPLES (1)
NO. = 11			DUMES (1)
TYPES = 4			
INDIV = 11			
<u>CEREALS</u>	CORN FLOUR	CREAM	-
NO. = 3	CEREAL (2)	OF WHEAT (1)	
TYPES = 2			
INDIV = 3			
<u>BEVERAGES</u>	"JUICE" (28)	ORANGE	MALT (9)
NO. = 117		JUICE (16)	LEMONADE (9)
TYPES = 18		WATER (11)	SODA (5)
INDIV = 100		TEA (MILK	GINGER BEER (5)
		& SUGAR) (16)	LIMEADE (6)

TABLE 41: CONTINUED

## B. MEAL PATTERNS

1. AM FOOD PATTERNS, N = 290

PATTERN I (75): MEAT + STARCH + BEVERAGE OR MILK  
 PATTERN II (62): BREAD + BEVERAGE OR MILK  
 PATTERN III (35): STARCH + BEVERAGE OR MILK  
 PATTERN IV (25): MEAT + STARCH + VEG/FRUIT + BEVERAGE  
 OR MILK  
 PATTERN V (15): CEREAL + MILK + BEVERAGE  
 TOTAL = 212

2. NOON FOOD PATTERNS, N = 241

PATTERN I (38): MEAT + STARCH + BEVERAGE  
           (12): MEAT + STARCH + VEGETABLE  
           (13): MEAT + STARCH + VEG/STARCHY ROOT  
                   CROP  
           (4): MEAT + STARCH + VEG/BREAD  
 PATTERN II (28): MEAT + BEVERAGE  
 PATTERN III (19): MEAT + LEGUME  
           (4): MEAT + LEGUME + VEG  
           (2): MEAT + LEG + VEG + STARCH  
           (2): MEAT + LEG + VEG + STARCH + STARCHY  
                   ROOT CROP  
           (3): MEAT + LEG + BREAD  
           (2): MEAT + LEG + STARCH  
 PATTERN IV (20): BREAD + BEVERAGE  
 PATTERN V (18): MEAT + VEGETABLE + BEVERAGE  
 PATTERN VI (14): STARCH + BEVERAGE

TABLE 41: CONTINUED  
 B. FOOD PATTERNS, CONTINUED

2. NOON FOOD PATTERNS, CONTINUED

PATTERN VII (9): MEAT + STARCHY ROOT CROP + BEVERAGE

PATTERN VIII (5): CEREAL + MILK

(3): CEREAL + MILK + MEAT + STARCH

(2): CEREAL + MILK + MEAT + STARCH + VEG  
 OR FRUIT

TOTAL = 198

3. PM FOOD PATTERNS, N = 243

PATTERN I (55): MEAT + STARCH + BEVERAGE

(10): MEAT + STARCH + STARCHY ROOT CROP

(4): MEAT + STARCH + BREAD

(3): MEAT + STARCH + FRUIT

PATTERN II (20): MEAT + STARCH + VEG + BEVERAGE

(2): MEAT + STARCH + VEG + STARCHY ROOT  
 CROP

(3): MEAT + STARCH + VEG + FRUIT

PATTERN III (23): MEAT + BEVERAGE

PATTERN IV (15): STARCH + BEVERAGE

PATTERN V (17): BREAD + BEVERAGE

PATTERN VI (11): MEAT + LEGUME + BEVERAGE

(6): MEAT + LEG + VEG/STARCHY  
 ROOT CROP

(5): MEAT + LEG + STARCH OR BREAD

(3): MEAT + LEG + STARCH + VEG/STARCHY  
 ROOT CROP

TOTAL = 177

\* Total number of times an item from this  
 category was listed

\*\* Total number of different items listed per category

+ Total number of individuals who listed at least  
 one item in the category

TABLE 42: KENDALLS TAU B CORRELATION COEFFICIENTS  
FOR DIETARY COMPLEXITY (DC) SCORE, DIETARY ADEQUACY  
(DA) SCORE AND SELECTED SOCIOECONOMIC VARIABLES\*

	(1)	(2)	(3)	(4)
(1) DC SCORE	1.000 0.000			
(2) DA SCORE	0.339 0.000	1.000 0.000		
(3) "LUXURY"	0.112 0.006	0.042 0.322	1.000 0.000	
(4) # ROOMS	0.103 0.016	0.141 0.002	0.033 0.422	1.000 0.000
(5) OWN CAR	0.155 0.002	0.120 0.023	0.113 0.017	0.208 0.000
(6) OCCUP. LEVEL	0.108 0.027	0.119 0.022	0.089 0.054	0.139 0.005
(7) NUTR. EDUC.	-0.139 0.005	-0.155 0.003	-0.090 0.057	-0.175 0.001
(8) TRAVEL	0.137 0.003	0.090 0.067	- -	0.306 0.000
(9) FRIEND	0.167 0.001	0.141 0.007	- -	0.221 0.000
(10) RELATIVES	0.031 0.571	0.043 0.396	- -	0.297 0.000
(11) FISHING	0.143 0.004	0.122 0.020	-0.033 0.484	-0.032 0.527
(12) ANIM. FREQ.	0.070 0.127	0.060 0.217	-0.069 0.116	0.107 0.022



TABLE 42: CONTINUED

	(1)	(2)	(3)	(4)
(13) CROP FREQ.	0.062 0.158	0.030 0.520	-0.130 0.002	0.166 0.000
(14) RES. SCORE	0.072 0.095	0.033 0.473	-0.126 0.002	0.173 0.000
(15) SELL ANIM.	0.053 0.027	0.134 0.010	-0.052 0.266	0.060 0.227
(16) SELL CROPS	0.027 0.585	0.095 0.070	-0.137 0.004	0.109 0.028
	(5)	(6)	(7)	(8)
(6) OCCUP. LEVEL	0.194 0.001	1.000 0.000		
(7) NUTR. EDUC.	-0.091 0.120	-0.091 0.111	1.000 0.000	
(8) TRAVEL	0.284 0.000	0.059 0.271	-0.202 0.000	1.000 0.000
(9) FRIEND	0.050 0.391	-0.026 0.645	-0.293 0.000	0.251 0.000
(10) RELATIVES	0.112 0.043	0.016 0.768	-0.062 0.263	0.191 0.000
(11) FISHING	0.081 0.163	-0.248 0.000	0.008 0.896	0.051 0.352
(12) ANIM. FREQ.	-0.092 0.089	-0.110 0.037	-0.118 0.028	- -
(13) CROP FREQ.	-0.013 0.798	-0.053 0.299	-0.126 0.015	- -
(14) RES. SCORE	-0.039 0.437	-0.086 0.083	-0.139 0.006	- -

TABLE 42: CONTINUED

	(5)	(6)	(7)	(8)
(15) SELL ANIM.	-0.0115 0.842	-0.068 0.232	-0.095 0.099	0.079 0.142
(16) SELL CROPS	-0.075 0.192	-0.134 0.018	-0.131 0.023	- -
	(9)	(10)	(11)	(12)
(9) FRIEND	1.000 0.000			
(10) RELATIVES	0.218 0.000	1.000 0.000		
(11) FISHING	0.038 0.516	0.031 0.571	1.000 0.000	
(12) ANIM. FREQ.	- -	- -	0.163 0.002	1.000 0.000
(13) CROP FREQ.	- -	- -	0.115 0.026	0.260 0.000
(14) RES. SCORE	- -	- -	0.140 0.006	0.584 0.000
(15) SELL ANIM.	0.147 0.011	0.118 0.032	0.102 0.078	0.460 0.000
(16) SELL CROPS	- -	- -	0.106 0.068	0.316 0.000
	(13)	(14)	(15)	16)
(13) CROP FREQ.	1.000 0.000			
(14) RES. SCORE	0.803 0.000	1.000 0.000		
(15) SELL ANIM.	0.248 0.000	0.364 0.000	1.000 0.000	

TABLE 42: CONTINUED

\* "Luxury" - the second of six dimensions produced by a principle components analysis (varimax rotation, eigenvalue cut-off of 1.0) of 20 pre-selected household items. Included a clothes washer (0.68), clothes dryer (0.64), color TV (0.61), sewing machine (0.53), electric fan (0.50) and phone (0.42).

# Rooms - number of rooms in the respondent's house.

Own car - ownership of a car by any household member (1 = no, 2 = yes).

Occup. level - occupational level of the chief wage earner (1 = low-income, 2 = medium-income, 3 = white collar, 4 = professional).

Nutr. educ. - whether or not the person in the household who prepares the food received any nutrition education (1 = yes, 2 = no).

Travel - extent of travel by any household member (0 = no travel, 1 = Eastern Caribbean, 2 = Greater Caribbean, 3 = U.S./Canada, 4 = Europe).

Friend - whether or not the respondent has a friend from overseas (1 = no, 2 = yes).

Relatives - whether or not the respondent has relatives living overseas (0 = none or have relatives, but do not communicate, 1 = have relatives, sometimes communicate, 2 = have relatives, communicate often).

Fishing - whether or not a household member catches fish for the household (1 = no, 2 = yes).

Anim. freq. - Animal Frequency Score (see Table 31).

Crop freq. - Crop Frequency Score (see Table 31).

Res. score - Resources Score (see Table 31).

Sell anim. - whether or not a respondent's household sold part or all of its animal products (1 = no, 2 = yes).

Sell crops - whether or not a respondent's household sold part or all of its crops (1 = no, 2 = yes).

TABLE 43: FOODS CHOSEN AS EXTRA FOOD PURCHASES  
AND REASONS WHY

<u>RESPONSE</u>	<u>REASON (CELLS = NO. RESPONDENTS)</u>							
	<u>NO</u> <u>ANS</u>	<u>HEALTH</u> <u>&amp; NUTR</u>	<u>PREF</u>	<u>AVAIL</u>	<u>COST</u>	<u>NEED</u>	<u>MULT</u> <u>REAS</u>	<u>MISC</u>
NOTHING	3	0	0	0	0	0	0	3
SAME	0	0	0	0	0	0	0	1
EVERY -THING	0	0	3	1	1	0	0	0
NUTRITIOUS FOODS	1	0	0	0	0	0	0	0
MEAT, DAIRY	0	189	66	4	1	13	12	2
PEAS & BEANS	0	5	0	2	0	0	1	0
VEGETABLES	1	174	56	27	3	3	19	5
CARROT & CABBAGE	0	128	21	15	0	2	10	4
FRUITS, FRUIT PRDS	0	40	11	2	0	0	7	0
GRAINS & CEREALS	0	12	67	40	3	22	12	21
STARCHES	0	2	13	0	1	1	2	2
SUGAR, BUTTER	0	2	7	3	0	4	1	1
HEALTH PRODUCTS	0	4	0	0	0	0	0	0
MISC.	0	0	2	0	1	0	2	0

TABLE 44: HEALTH-RELATED REASONS FOR PREFERING  
CERTAIN FOODS AS EXTRA PURCHASES

<u>REASON</u>	<u># RESPONSES</u>			
	<u>CABBAGE</u>	<u>CARROT</u>	<u>STARCHY R CROPS (1)</u>	<u>OTHER VEGS (2)</u>
1-NUTRITIOUS	29	30	10	88
2-CONTAINS LOTS OF VITAMINS	3	2	-	5
3-RICH IN PROTEIN	-	-	-	3a
4-PROTECTS THE BODY FROM STARCH	1	3	-	4
5-FOR IRON	-	8	-	-
6-TO GIVE ENERGY	-	-	-	-
7-FOR A BALANCED DIET	-	-	1	2
8-GOOD FOR THE SIGHT	-	2	-	-
9-DOCTOR'S ADVICE /HEALTH REASONS	6	6	1	18
10-FOR BODY STRENGTH & HEALTH	8	9	4	20
11-BUILDS THE BODY	-	-	-	2
12-VERY SUBSTANTIAL	-	-	-	-
13-GOOD FOR THE BODY	13	10	-	19
14-GOOD FOR THE BLOOD	-	-	-	2

- (1) Sweet potato, plaintain, yam, white potatoes, bugament, cassava, "ground provisions"  
 (2) Tomato, "vegetables," lettuce, spinach, cucumber, beets, eggplant, pumpkin, eddo tops, peas, squash, onion, string beans, canned corn & canned green peas, "green vegetables," cauliflower, okra  
 a - "vegetables," lettuce, peas (red bean)

TABLE 44: CONTINUED

<u>REASONS</u>	<u>MILK</u>	<u># RESPONSES</u>		<u>POULTRY</u>
		<u>FRESH FISH</u>	<u>BEEF OR MEAT</u>	
1-NUTRITIOUS	5	19	28	15
2-CONTAINS LOTS OF VITAMINS	4	3	1	4
3-RICH IN PROTEIN	15	5	5	2
4-PROTECTS THE BODY FROM STARCH	-	-	-	-
5-FOR IRON	-	-	-	-
6-TO GIVE ENERGY	3	-	-	-
7-FOR A BALANCED DIET	-	-	-	-
8-GOOD FOR THE SIGHT	-	-	-	-
9-DOCTOR'S ADVICE /HEALTH REASONS	-	1	2	1
10-FOR BODY STRENGTH & HEALTH	7	6	1	2
11-BUILDS THE BODY	9	1	-	-
12-VERY SUBSTANTIAL	3	3	-	1
13-GOOD FOR THE BODY	3	7	7	5
14-GOOD FOR THE BLOOD	-	-	-	-

TABLE 44: CONTINUED

<u>REASON</u>	<u># RESPONSES</u>				
	<u>EGG</u>	<u>CHEESE</u>	<u>FRUIT+</u>	<u>STARCH*</u>	<u>OVALTINE</u>
1-NUTRITIOUS	6	10	-	5	-
2-CONTAINS LOTS OF VITAMINS	-	15	-	-	-
3-RICH IN PROTEIN	3	-	-	-	4
4-PROTECTS THE BODY FROM STARCH	-	-	-	-	-
5-FOR IRON	-	5a	3	-	-
6-TO GIVE ENERGY	-	-	-	1	-
7-FOR A BALANCED DIET	-	-	-	-	-
8-GOOD FOR THE SIGHT	-	-	-	-	-
9-DOCTOR'S ADVICE /HEALTH REASONS	-	1	-	1b	-
10-FOR BODY STRENGTH & HEALTH	-	4	-	-	-
11-BUILDS THE BODY	-	-	1	-	-
12-VERY SUBSTANTIAL	-	-	-	-	2
13-GOOD FOR THE BODY	4	5	-	-	2
14-GOOD FOR THE BLOOD	-	-	-	-	-

+ Bananas, "fresh fruits," citrus fruit & juices,  
"fruit juice," apples, grapes, pears, papaya, coconut  
\* flour, macaroni, bread, rice  
a - bananas  
b - rice

TABLE 45: FOODS PREFERRED AS EXTRA FOOD  
PURCHASES\*, CONTRASTING LOCAL FOODS+  
OR TRADITIONAL FOOD INGREDIENTS  
WITH OTHER IMPORTED FOODS

I. LOCAL ITEMS OR INGREDIENTS  
FOR TRADITIONAL FOODS

<u>ITEM</u>	<u>#</u> <u>ANS.</u>
A-FRESH VEGETABLES (CABBAGE, CARROT, STARCHY ROOT CROPS, SQUASH, OKRA, EGGPLANT, TOMATO, SPINACH, "VEGETABLES," STRING BEANS, LETTUCE, CUCUMBER, ONION, BEETS, GREEN PEPPERS, GREEN VEGETABLES)	459
B-STAPLE STARCHES (RICE, CORN MEAL, FLOUR, SUGAR, BREAD)	187
C-MEATS & EGG (BEEF, CHICKEN, PORK, GOAT, MUTTON)	152
D-FISH (FRESH, SALTED)	69
E-FRUITS (BANANA, PAPAYA, ORANGES, COCONUT, AVOCADO PEAR, MANGO, GRAPES & "FRESH FRUITS")	50

II. OTHER IMPORTED FOODS

A-MILK, CHEESE	67
B-STARCHES (MACARONI, SPAGHETTI)	19
C-FRUITS (APPLES, PEACHES, PEARS)	7
D-CEREALS (CORNFLAKES, CREAM OF WHEAT, OATS)	5
E-MISCELLANEOUS (HOT DOG, BUTTER, PIZZA, MAYONNAISE, CANNED SOUP)	7
F-FORTIFIED FOOD BEVERAGE POWDER (OVALTINE), VITAMINS	4

\* Excludes non-food responses such as "everything"  
"nothing" or "nutritious foods"

+ Locally produced by some households (see Tables  
26 & 28)



TABLE 46: FOODS AVOIDED BY THE HOUSEHOLD  
AND REASONS WHY

<u>RESPONSE</u>	<u>REASON FOR CHOICE (# RESPONSES)</u>						<u>*</u>
	<u>NO</u> <u>ANS</u>	<u>DIS</u> <u>-LIKE</u>	<u>NOT</u> <u>CUST</u>	<u>RELIGION</u>	<u>UN</u> <u>-CLEAN</u>	<u>HEALTH</u>	
NONE	0	0	0	0	0	0	0
DISLIKE MOST FOODS	0	0	0	0	0	0	1
PORK	1	4	0	25	18	3	1
TRAD FOODS	0	46	3	0	0	3	1
MEATS	0	5	0	1	3	8	2
SEAFOODS	0	5	0	9	0	6	1
FRUITS & VEGS	0	24	1	0	0	9	1
STARCHES	0	8	0	1	0	1	0
IMPORTED FOODS	0	2	0	1	0	3	1
MISC	0	2	0	0	0	2	0

\* Miscellaneous reasons

TABLE 47: ASSOCIATIONS BETWEEN THE PERCEIVED  
EXPENSE OF FRESH FISH AND  
SELECTED SOCIOECONOMIC VARIABLES

<u>RESIDENCE</u>	<u>PERCEIVED EXPENSE (FREQ)</u>			<u>TOTAL</u>
	<u>CHEAP</u>	<u>MID-COST</u>	<u>EXPENSIVE</u>	
	<u>(1 TO 2)</u>	<u>(3 TO 5)</u>	<u>(6 TO 7)</u>	
CITY	55	55	37	147
VILLAGES	46	60	42	148
TOTAL	101	115	79	295

\* chi-square p = 0.51

<u>OCCUP LEVEL</u>	<u>PERCEIVED EXPENSE (FREQ)</u>			<u>TOTAL</u>
	<u>CHEAP</u>	<u>MID-COST</u>	<u>EXPENSIVE</u>	
	<u>(1 TO 2)</u>	<u>(3 TO 5)</u>	<u>(6 TO 7)</u>	
LOW-INCOME	29	39	23	91
MED-INCOME	40	40	25	105
WHITE COLLAR PROFESSIONAL	20	23	16	59
TOTAL	94	102	69	265

\* chi-square p = 0.24

TABLE 47: CONTINUED

<u>SHOP AT</u> <u>FISH MARKET</u>	<u>PERCEIVED EXPENSE (FREQ)</u>			<u>TOTAL</u>
	<u>CHEAP</u> <u>(1 TO 2)</u>	<u>MID-COST</u> <u>(3 TO 5)</u>	<u>EXPENSIVE</u> <u>6 TO 7)</u>	
YES	61	76	41	178
NO	40	37	36	113
TOTAL	101	113	77	291

\* chi-square p = 0.15

<u>FISHING</u>	<u>PERCEIVED EXPENSE (FREQ)</u>			<u>TOTAL</u>
	<u>CHEAP</u> <u>(1 TO 2)</u>	<u>MID-COST</u> <u>(3 TO 5)</u>	<u>EXPENSIVE</u> <u>(6 TO 7)</u>	
YES	77	95	74	246
NO	23	17	4	44
TOTAL	100	112	78	290

\* chi-square p = 0.004

TABLE 48: ASSOCIATIONS BETWEEN THE PERCEIVED EXPENSE OF FRESH VEGETABLES AND SELECTED SOCIOECONOMIC VARIABLES

<u>RESIDENCE</u>	<u>PERCEIVED EXPENSE (FREQ)</u>			<u>TOTAL</u>
	<u>CHEAP</u>	<u>MID-COST</u>	<u>EXPENSIVE</u>	
	<u>(1 TO 2)</u>	<u>(3 TO 5)</u>	<u>(6 TO 7)</u>	
CITY	34	45	71	150
VILLAGES	35	64	50	149
TOTAL	69	109	121	299

\* chi-square p = 0.03

<u>RAISE CROPS</u>	<u>PERCEIVED EXPENSE (FREQ)</u>			<u>TOTAL</u>
	<u>CHEAP</u>	<u>MID-COST</u>	<u>EXPENSIVE</u>	
	<u>(1 TO 2)</u>	<u>(3 TO 5)</u>	<u>(6 TO 7)</u>	
YES	22	32	52	106
NO	47	77	69	193
TOTAL	69	109	121	299

\* chi-square p = 0.08

<u>OCCUP LEVEL</u>	<u>PERCEIVED EXPENSE (FREQ)</u>			<u>TOTAL</u>
	<u>CHEAP</u>	<u>MID-COST</u>	<u>EXPENSIVE</u>	
	<u>(1 TO 2)</u>	<u>(3 TO 5)</u>	<u>(6 TO 7)</u>	
LOW-INCOME	21	38	32	91
MED-INCOME	26	38	43	107
WHITE COLLAR	16	18	27	61
PROFESSIONAL	4	3	3	10
TOTAL	67	97	105	269

\* chi-square p = 0.707

TABLE 49: KENDALLS TAU B CORRELATION COEFFICIENTS  
 BETWEEN EXPENSE RATINGS OF SELECTED FOODS  
 AND SELECTED SOCIOECONOMIC VARIABLES

	(1)	(2)	(3)	(4)
1-EXPENSE	1.000			
FRESH FISH	0.000			
2-EXPENSE	0.278	1.000		
FRESH VEGS	0.000	0.000		
3-EXPENSE	0.176	0.143	1.000	
MILK	0.000	0.001	0.000	
4-FISHING	-0.165	-0.126	-0.112	1.000
ACTIVITY	0.001	0.001	0.028	0.000
5-OWNERSHIP	-	-	0.139	-
OF REFRIG	-	-	0.006	-
6-ANIMAL	-	-0.151	-	0.163
FREQ	-	0.001	-	0.002
7-RESOURCES	-	-0.105	-	0.140
SCORE	-	0.017	-	0.006
# WOMEN	-	0.100	-	-
IN HOUSE	-	0.039	-	-
	(5)	(6)	(7)	(8)
5-OWNERSHIP	1.000			
OF REFRIG	0.000			
6-ANIMAL	0.110	1.000		
FREQ	0.039	0.000		
7-RESOURCES	0.142	0.584	1.000	
SCORE	0.005	0.000	0.000	
8-# WOMEN	0.140	-	-	1.000
IN HOUSE	0.012	-	-	0.000

TABLE 49: CONTINUED

\* Expense fresh fish - respondents' perceptions of the expense of fresh fish, ranked from 1 (inexpensive) to 7 (very expensive).

Expense fresh vegg - respondents' perceptions of the expense of fresh vegetables, ranked from 1 (inexpensive) to 7 (very expensive).

Expense milk - respondents' perceptions of the expense of milk, ranked from 1 (inexpensive) to 7 (very expensive).

Fishing activity - whether or not a household member catches fish for the household (1 = no, 2 = yes).

Ownership of refrig. - whether or not the respondent's household owns a refrigerator (1 = no, 2 = yes).

Animal Freq. - Animal Frequency Score (see Table 31).

Resources Score - see Table 31.

# women in house - the number of women in the respondent's house.

FIGURE 1: FREQUENCY DISTRIBUTION  
OF DIETARY COMPLEXITY SCORES

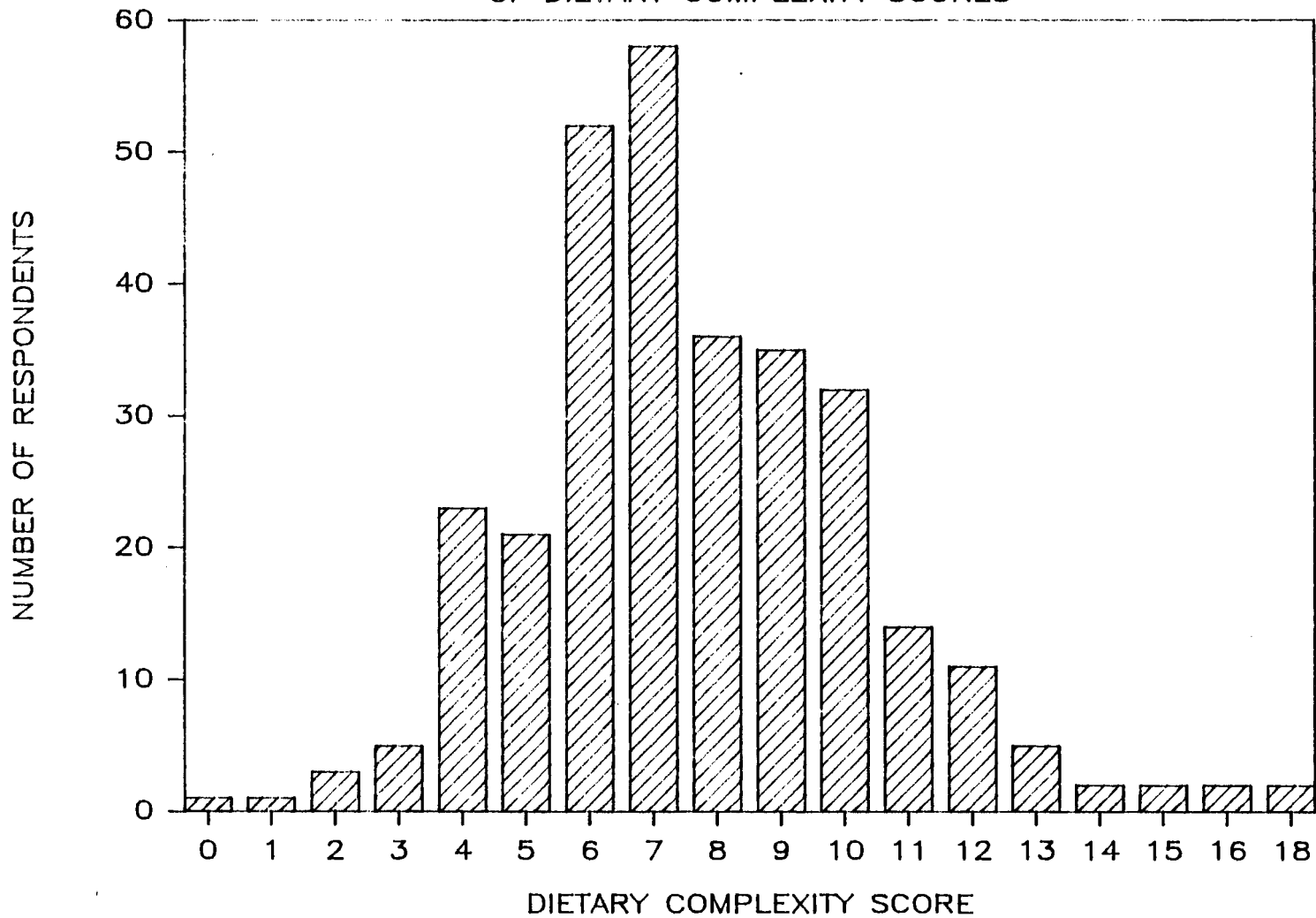
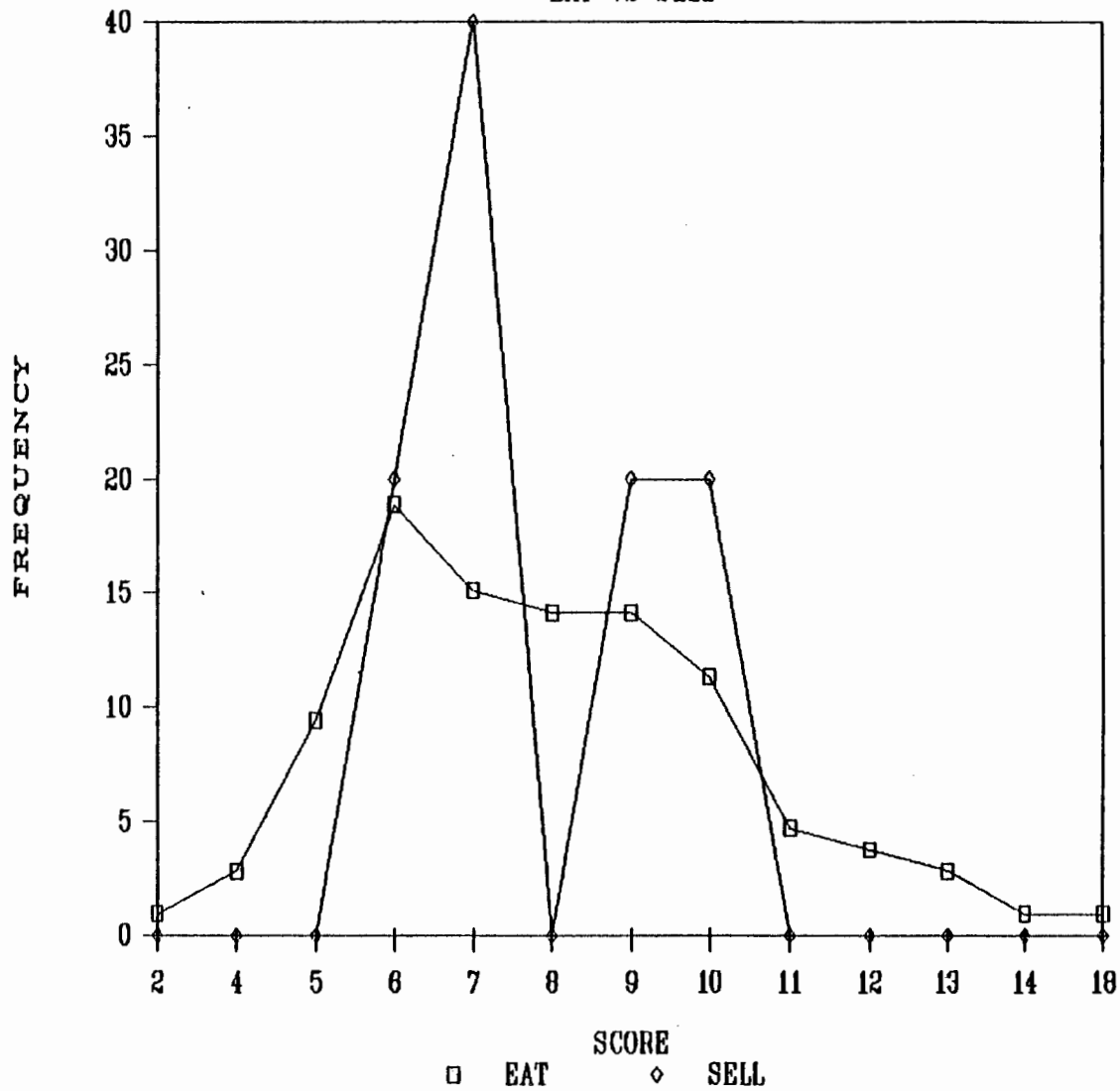


FIGURE 2:  
COMPLEXITY SCORE DISTRIBUTION  
EAT VS SELL





# FIGURE 3: RESPONDENTS' RANKINGS OF AVAILABILITY OF SELECTED PRODUCTS

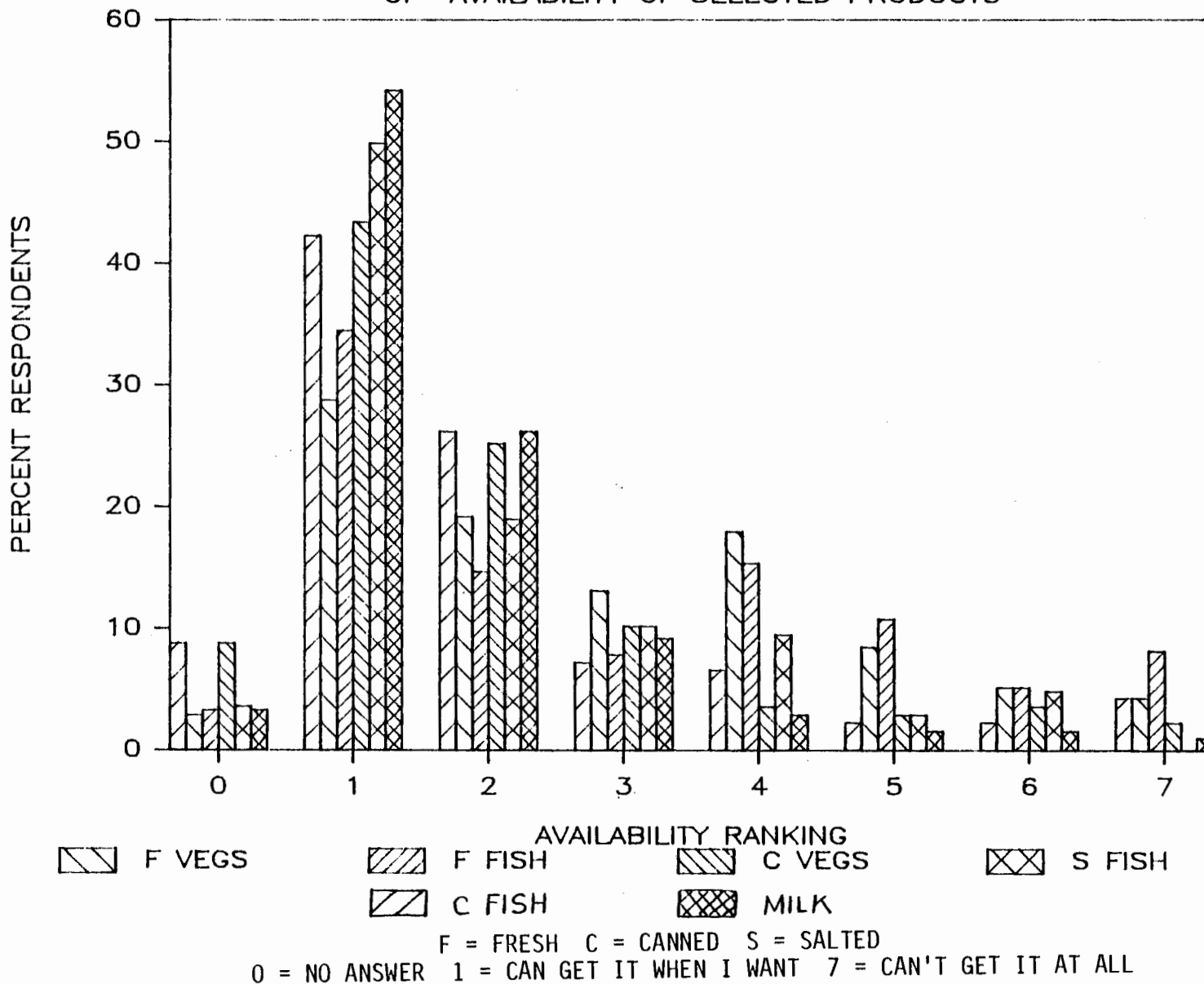


FIGURE 4: RESPONDENTS' RANKINGS  
OF EXPENSE OF SELECTED PRODUCTS

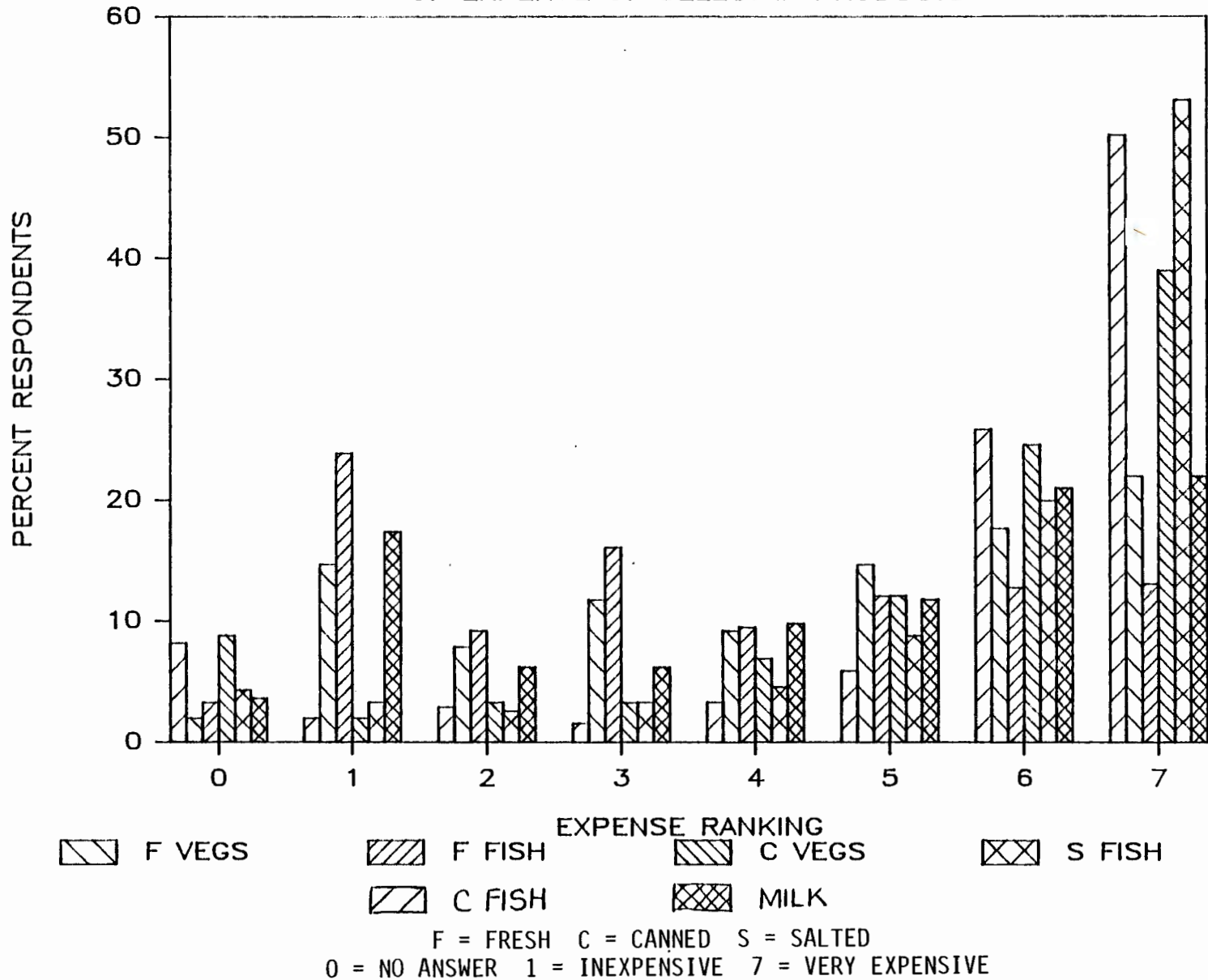


FIGURE 5: PERCEIVED IMPORTANCE OF  
SELECTED CONCEPTS WHEN PURCHASING FOOD

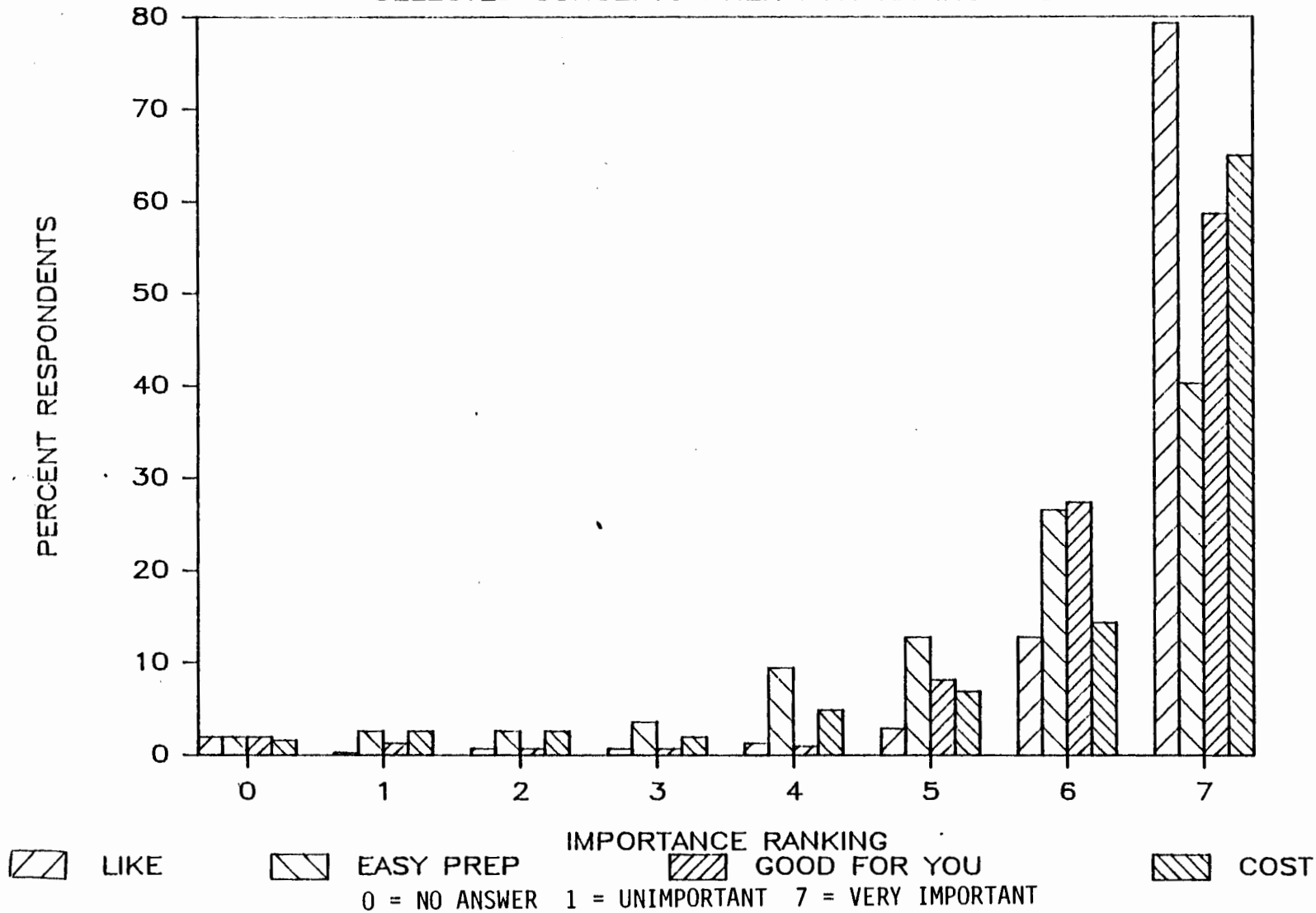
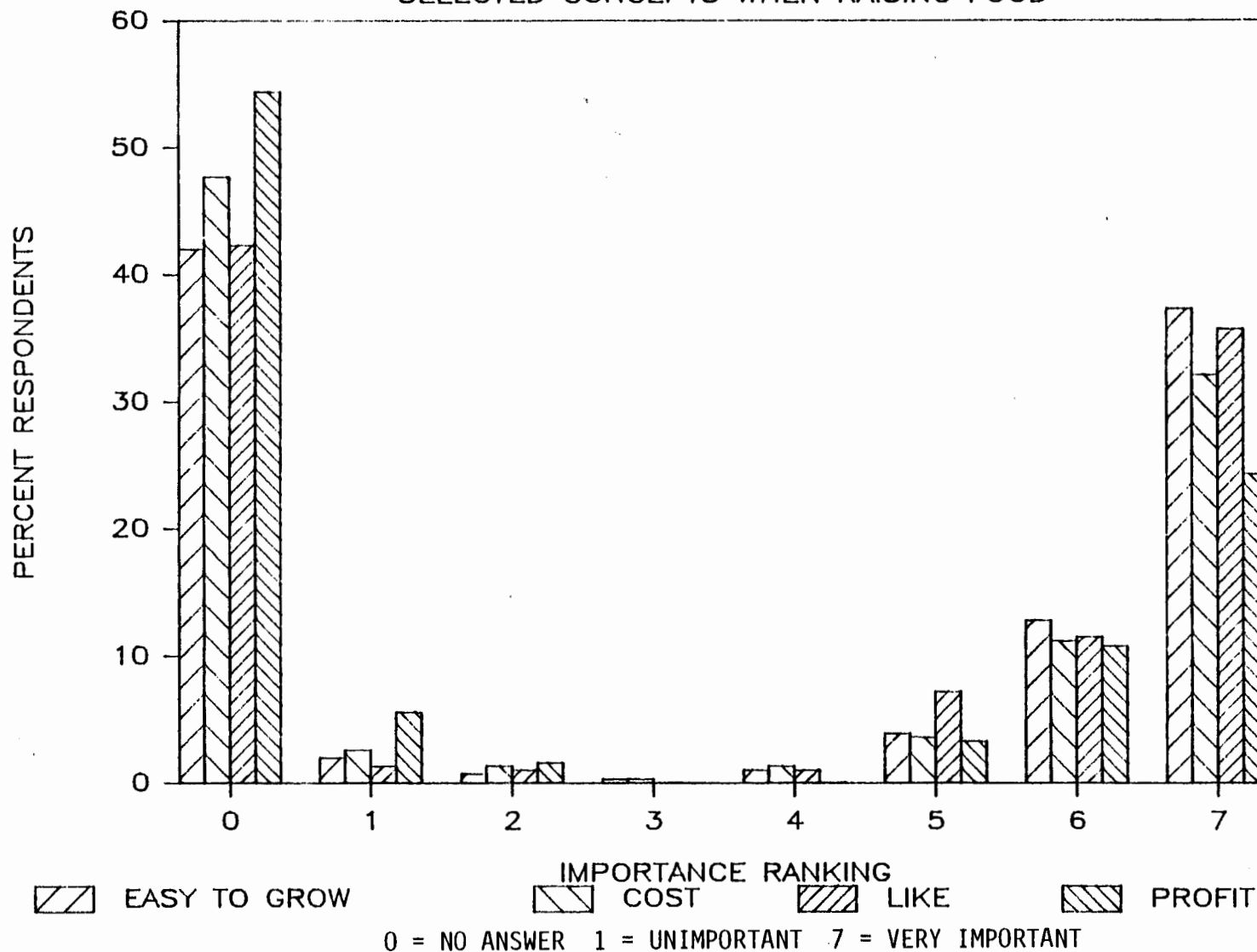


FIGURE 6: PERCEIVED IMPORTANCE OF  
SELECTED CONCEPTS WHEN RAISING FOOD



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