INDIGENOUS FOOD PATTERNS OF LOW INCOME INDIVIDUALS FROM NORTH CENTRAL UNITED STATES

by

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DEDICATION

I wish to dedicate this paper to:

Arthur D. Dayton

with my fondest love.

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INTRODUCTION

Previous analysis of low-income populations usually assumed that this group is homogenous. The positive deviant method developed by Wishik and Van der Vynct (1) has been used in this study to identify those low-income subjects whose nutritional status was greater than expected and to discover why this group was doing better than other groups with similar resources. Food habits already practiced by a group with good dietary intakes are more likely to be accepted by other members of a similar low-income population than external practices. The present research was conducted to identify indigenous food patterns of selected segments of the low-income population. Identification of socio-economic and dietary factors that are the most important constraints against positive dietary intake will help nutritionists understand problems that must be addressed before low-income families can improve their diets.

The objectives of this research are as follows:

1. To identify that segment of the low-income population with unexpectedly good nutrient intake (positive deviants) and that segment with unexpectedly poor nutrient intake (negative deviants).
2. To analyze the socio-economic characteristics of both the positive and the negative deviants for similarities within the groups and differences between the groups.
3. To examine consumption of specific foods for an indigenous food pattern which may have existed within either the positive or negative deviant group and to determine if there was a significant difference in food patterns between the groups.

4. To identify a set of variables that will predict consumption of unexpectedly high or low levels of nutrients in a low-income population.

REVIEW OF LITERATURE

Nutritional Quality Indicators

Nutritionists have tried for many years to develop a single indicator that could be used to measure the nutritional quality of individual diets. The National Research Council has published Recommended Dietary Allowances (RDA) for 17 different nutrients and energy (2). The RDA for a specific nutrient identifies the average daily amount of that nutrient a specific healthy sex or age group should consume. RDAs should not be considered as requirements for a specific individual. The RDAs for all nutrients except calories, have been set at two standard deviations above the mean requirement for the population, to allow a safety margin. Dietary intakes below the RDA do not necessarily mean an inadequate intake of that nutrient. Guthrie and Scheer (3) used two-thirds of the RDA as the level for an adequate diet following a pattern used by the United States Department of Agriculture in reporting findings from Household Dietary Surveys (4). Crocetti and Guthrie (5) used 80 percent of the RDA, because they believed there was a general consensus that this level was associated with minimal risk of a nutritional inadequacy. However Crocetti and Guthrie failed to report why they used 80 percent of the RDA instead of two-thirds of the RDA as did Guthrie and Scheer.

Summing individual nutrients to get an estimate of nutritional adequacy of a diet is an ineffective method of determining nutritional adequacy. This is because the sum alone does not indicate which nutrient or nutrients are limited in the diet. Summing individual nutrients also allows two unequal diets to be rated as equal. For example, a diet with 90 percent of the RDAs for all seven nutrients

would be rated equal to a diet with 100 percent of the RDA for six nutrients and 30 percent for one nutrient. This makes the task of developing a single nutritional quality indicator very difficult. Nevertheless, numerous investigators have attempted to do so, by developing a variety of scores, indexes, ratios, and classification systems. The succeeding sections will examine the strengths and weaknesses of a number of these methods.

Inadequacy Score

Crocetti and Guthrie (6) developed an indicator called the inadequacy score for use in analyzing data from the 1977-78 Nationwide Food Consumption Survey (NFCS) conducted by the U.S. Department of Agriculture. The survey included food intake data from a 24-hour dietary recall and two food records summed together and averaged for a three day score. Percent RDA was determined for seven nutrients: protein, calcium, iron, vitamin A, thiamin, riboflavin, and vitamin C. Each of the seven nutrients analyzed was "weighted" according to the percent of the RDA provided by the foods consumed during the survey. A weight of one was assigned if the nutrient met 80 percent or more of the RDA. A weight of two was assigned if the nutrient met between 60 and 79.9 percent of the RDA and a nine was assigned if the nutrient met 59.9 percent or less of the RDA. The weights from all seven nutrients were summed to produce a score. Individual scores ranged from seven (greater than or equal to 80 percent of the RDA for each of the seven nutrients) to 63 (each of the seven nutrients met less than or equal to 59.9 percent of the RDA). The inadequacy score is a sensitive indicator because it determines how many nutrients are inadequate. However, it

still lacks the ability to specify which nutrient or nutrients are inadequate. In 1982 Crocetti and Guthrie (5) referred to their inadequacy score as the marginality index (MI).

Protein/Fat/Carbohydrate Ratio (PFC)

Crocetti and Guthrie (5,6) used the protein/fat/carbohydrate ratio (PFC) to determine the proportion of macronutrients in the diet. They stated that although nutritionists are concerned with the proportion of these nutrients, there is no consensus as to what this ratio should be. The ranges they found most useful were 10.0-25.0 percent of calories consumed as protein, 20.0-35.0 percent calories consumed as fat, and 70.0-40.0 percent calories consumed as carbohydrates. Weights were assigned to the three macronutrients so that one represented a diet that had desirable proportions, two represented a diet that had proportions that could be improved, and nine represented a diet with poor proportions. The weights were summed, as in the inadequacy score, to determine diet quality. A score of three meant that all three macronutrients were in "desirable" proportions while a score of 27 meant that all three macronutrients were in "poor" proportions. Just as the inadequacy score could determine how many of the nutrients were inadequate, the PFC can determine how many of the macronutrients are out of balance, but can not show which specific macronutrient is the problem. The researchers used the PFC to analyze food consumption patterns and nutritional quality in diets of individuals in the 1977-78 Nationwide Food Consumption Survey. The authors found that only 45 percent of the diets analyzed had perfect PFC scores and that achieving a desirable proportion of macronutrients was not correlated with achieving nutrient adequacy, expressed as meeting the RDA's.

Food Energy Level

The food energy level (FEL) (7) was used as a nutritional quality indicator in an analysis of the Low-income Household subset of the 1977-78 Nationwide Food Consumption Survey. FEL was also used by the same researchers to evaluate the food stamp program (8). FEL is the caloric content of the food in the weekly household food supply divided by the number of adult males in the household. Calories were truncated at 150 percent of the RDA. The FEL allows for discard of drippings and excess fat from meat and discard of edible food as plate waste, spoilage, etc. In both studies the FEL was used in conjunction with other indicators, because FEL alone did not perform an adequate job of determining a diet's adequacy. Another shortcoming of the FEL is that it only recognizes the caloric level and disregards all other nutrients in the diet.

Diet Score

Morgan et al. (7) used the diet score as another means of determining nutrient adequacy. Diet score is the sum of the percent of the RDA for food energy and seven nutrients: protein, calcium, iron, vitamin A, thiamin, riboflavin and ascorbic acid. Values were truncated at 100 percent of the RDA so that the highest possible score, 800, would indicate that the individual had consumed at least 100 percent of the RDA for all seven nutrients and energy. This prevented the masking of low values of some nutrients by higher values of other nutrients. The diet score assumes that dietary intake should include the recommended amounts of each of the seven nutrients and energy. It also ranks a diet that is slightly below the RDA for several of the nutrients and energy

at the same level as a diet that is very low in one nutrient but adequate in all others.

Index of Nutritional Quality (INQ)

In 1973 Hansen (9) developed the concept of nutrient density or proportions of nutrients to calories in a food. Sorenson (10) in 1975 used this concept to develop an index of nutritional quality (INQ), to assess the nutritional quality of a diet. Windham et al. (11) used the INQ as a nutrient indicator for determining how consistent nutrient patterns are in U.S. diets. The formula for INQ is as follows:

$$\text{INQ} = \frac{\text{Amount of nutrient in 1000 kcal of food}}{\text{Human allowance of the nutrient per 1000 kcal}}$$

An INQ value greater than one for a nutrient indicates that the amount of that particular food or combination of foods that will satisfy the total energy requirement will also provide the RDA of that nutrient. An INQ value less than one would mean that an excess amount of calories would need to be consumed in order to get the needed amount of that nutrient. Windham et al. (12) also used the INQ to determine adequacy of consumption practices in the 1977-78 Nationwide Food Consumption Survey. In 1978 Abdel-Ghany (13) used the INQ to evaluate diets of 939 households in North Carolina. He found that the INQ provided a useful supporting measure for evaluating household diets. Other measures, such as percent RDA, when used to evaluate diets, merely indicate the degree to which households meet a specific level of nutrient intakes. The INQ as a supporting measure also indicates the proportion of different nutrients to calories in the diet.

Nutrient Density Ratio (NDR)

Nutrient density concept, the basis for INQ, was also used by Morgan et al. (7) to develop the nutrient density ratio (NDR). The NDR was calculated for seven nutrients: protein, calcium, iron, vitamin A, thiamin, riboflavin and ascorbic acid, from the low-income household data of the 1977-78 Nationwide Food Consumption Survey. The formula for NDR is as follows:

$$NDR = \frac{\text{Nutrient in diet/kcal in diet/1000 kcal}}{\text{RDA for nutrient/RDA for kcal/1000 kcal}^{1}}$$

If the nutrient density of a specific nutrient in the diet (numerator) is equal to the nutrient density of the RDA of that specific nutrient (denominator), the NDR is equal to 1.0. Any NDR over 1.0 is truncated at 1.0. If the nutrient density of a specific nutrient in the diet is less than the nutrient density of the RDA of that nutrient, the NDR is less than 1.0. For example an individual consuming 3600 kcals and 35 mg of ascorbic acid, and having a RDA of 2400 kcals and a RDA of 45 mg ascorbic acid, would have a NDR of .518.

$$NDR = \frac{\text{35 mg ascorbic acid/3600 kcal/1000 kcal}}{\text{45 mg ascorbic acid/2400 kcal/1000 kcal}} = .518$$

To determine the NDR of a whole diet, the seven NDR's for specific nutrients are summed, where a total of 7.0 means the diet is in balance with the RDAs. The shortcomings of the NDR are the same as those for diet score. NDR assumes it is equally important that the diet contain recommended amounts of each of the seven nutrients. Therefore, the NDR may rank unequal diets equal.

Johnson et al. (8) used a measure similar to the nutrient density ratio, called the minimum nutrient density ratio (MINNDR) to determine

the nutritional adequacy of low-income households participating in the food stamp program. The data came from the subset of Low-income Households in the 1977-78 Nationwide Food Consumption Survey. A diet, using the MINNDR would be defined as it's lowest NDR. For example if the NDR for seven nutrients in a diet were calculated to be 1.0, 0.8, 0.7, 1.0, 1.0, 0.8, and 1.0, the MINNDR for that diet would be 0.7. The researchers concluded that since MINNDR and another indicator, modified diet score, gave different results, that one or both did not appear to be an accurate measure of overall diet quality. Which of the measures was inaccurate, was not reported.

Classification System

Cosper (14) obtained 24-hour dietary recalls from 591 Kansas women to examine their food choices and eating behavior. The calories, protein, calcium, iron, vitamin A, thiamin, riboflavin, niacin and ascorbic acid, for each individuals diet were summed and compared to the appropriate RDA. Each diet was then classified according to the following scale: excellent, good, fair or poor if the diet met 100% or more, 66.7% or more, 56% or more, or less than 50% of the RDA, respectively. Cosper used 66.7 percent of the RDA as a cut off point for good diets because of the margin of safety built into the RDAs. Howe and Vaden (15) used Cosper's classification to examine diets of students who were participants or nonparticipants in the national school lunch program. However, they failed to state whether the Cosper classification was or was not a useful indicator of nutritional quality.

Diet Rating Index

Gilbert et al. (16) used the Diet Rating Index as a means of

computing the overall diet quality of elementary school aged children. The Diet Rating Index, adapted from Schafer (17), used the six nutrients, protein, vitamin A, ascorbic acid, thiamin, calcium and iron. A four-point scoring system was used for each nutrient:

1=nutrient intake less than 50% RDA
2=nutrient intake between 50% and less than 66% RDA
3=nutrient intake between 66% and less than 100% RDA
4=nutrient intake greater than or equal to 100% RDA

The overall quality of the diet was attained by summing the scores for each of the six nutrients. A maximum score of 24 indicated that 100 percent or more of the RDA for each nutrient was met. A minimum score of six meant that less than 50 percent of the RDA for all six nutrients had been consumed. The investigator did not report if the Diet Rating Index was a reliable measure of nutritional quality.

Nutrient Adequacy Ratio (NAR)

Madden et al. (18) used the nutrient adequacy ratio (NAR) to validate the 24-hour dietary recall of 76 elderly subjects participating in a congregate meal program in Pennsylvania. NAR is the ratio of a subject's intake of a specific nutrient to that individual's requirement for that nutrient. The formula used for NAR's is as follows:

$$NAR = \frac{\text{dietary intake of a nutrient}}{\text{RDA for that nutrient}}$$

Guthrie and Scheer (3) used the NAR to validate a dietary score for assessing nutrient adequacy, based on the four food groups. The NAR according to the authors is a complete, but time-consuming dietary indicator. Guthrie and Scheer (19) also used the NAR to determine if a diet based on the four-food groups could provide an adequate diet. Through the use of the NAR the researchers supported a criticism (20) of

the Basic Four Food Groups. They concluded that one can eat the proper number of servings from all four groups and still not consume an adequate amount of vitamins and minerals.

Nutrient Adequacy Reporting System (NARS)

According to Johnson et al. the nutrient adequacy reporting system (NARS) used by extension home economists and their assistants, is a very effective method of dietary assessment (21). In this system the quantified intake of 150 common foods is recorded. These foods are arranged into 16 groups according to similarity of nutrient composition. The foods can be varied according to the geographic region or ethnic background of the group under study. The diet calculation sheet contains a series of boxes and half boxes representing portion sizes of the 150 foods. A whole box represented a full serving and a half box, a half serving. Foods consumed in portions equal to or less than one-quarter of a normal portion size were not reported. Serving size specifications were based on average values obtained by Hankin et al. (22). Nutrient adequacy of the diet was estimated by calculating mean daily intakes for 12 nutrients for each individual and then comparing these to the RDA's. Mean daily intakes were determined by multiplying the number of boxes and half boxes by the nutrient mean of each of the 16 food groups. These values were then summed and divided by the number of food groups involved. The NARS were tested for accuracy using dietary recalls of 66 program assistants in the University of Wisconsin Extension's Expanded Food and Nutrition Education Program (EFNEP). The NARS was validated by comparing it to a long hand method of comparing each separate nutrient to it's RDA. Results indicated that the NARS method was as good as the long hand method. Johnson concluded that the

NARS is a useful tool for monitoring and evaluating nutrition education programs.

Mean Adequacy Ratio (MAR)

Madden et al. (18) used the nutrient adequacy ratio (NAR) to calculate mean adequacy ratio (MAR). The MAR is a simple average of the NAR's with each NAR being truncated at a maximum score of 100. NAR scores are truncated so that equal weight is given to each nutrient and an excessive intake of one nutrient cannot compensate for an inadequate intake of another nutrient. The formula for MAR is as follows:

$$\text{MAR} = \frac{\text{sum of nutrient adequacy ratio (NAR) for X nutrients truncated at 100}}{\text{X number of nutrients}}$$

As Crocetti and Guthrie (5,6) have pointed out, the MAR score does not specify which nutrient or nutrients are inadequate in the diet and masks extremely high or low intakes of a nutrient. For example it is possible for individuals who have very different dietary intakes to have identical MAR scores. A MAR score of 80 could mean seven values of 80 each, six values of 90 and one of 20, five values of 100 and two of 30, etc. In spite of these disadvantages the MAR has been used by Guthrie and Scheer (3) to validate the dietary score. The dietary score as used by the Expanded Food and Nutrition Education Program (EFNEP), is based on the Basic Four Food Guide. Points are given, with two points for each of two items in the milk group and protein group, and one point for each of four items in the fruit or vegetable group and cereal or bread group. The benefits of the dietary score is that it is very easy to understand and little training is required to use it. Guthrie and Scheer scored diets using both the MAR's and the dietary score. They

found the dietary score was a very useful and easy nutrient adequacy indicator.

In 1982 Crocetti and Guthrie (5) used the following catergories of MAR values to classify individual diets:

Greater than or equal to 80.0 MAR = desirable
Greater than or equal to 60.0-79.9 MAR = acceptable
Less than or equal to 59.9 MAR = marginal

Again the use of an 80.0 MAR value assumes that an intake of an 80.0 percent of the RDA is desirable for most individuals because the risk associated with this level of dietary intake is minimal.

FOOD CONSUMPTION SURVEYS

The nutritional quality indicators previously mentioned have all been used in traditional nutrition studies to analyze dietary patterns, determine percent of the RDA's met by specific nutrients, and correlate diet with income and/or ethnic origin. Although this approach is important and useful, Sanjur and Scoma (23) have explored a broader concept of food behavior which includes food consumption patterns, attitudes and preferences for certain foods, and meal patterns. All of these have been studied in light of sociocultural effect. Caster (24) stated that when directing feeding programs or planning nutrition education programs for different cultural groups, food consumption information is often very crucial. Food frequency data not only allows direct evaluations in nutrient terms, but provides specific information concerning those foods which are frequently eaten by a major proportion of the target population. The following section is a review of several food consumption surveys that use this broader concept of nutrition studies with emphasis on the low income population.

Diet histories of 114 women (mostly working mothers), living in Northeast Georgia were analyzed by Caster (24). The 77 black and 37 white low income subjects were asked how frequently (per day, per week, or per month) they consumed foods from a list of 150 foods. The foods were grouped as Milk and Dairy Products, Beef, Pork, Poultry, Fish, Other Meat Products, Meat Alternatives, Fruit, Vegetables, Cereals and Bread, Fats, Soups, Desserts, Sweets and Pastries. Frequencies of intake for each of the 150 foods were determined for the entire group of women but not for individuals. The factor 0.9 was used to adjust serving size for the fact that the subjects were women and therefore would eat smaller portion sizes. In the estimation of nutrient intakes, the intake frequencies (times 0.9) were multiplied by each of the nutrient content values (25) for an average serving of each of the foods consumed.

The most frequently consumed foods were: milk, coffee (or tea), soft drinks, citrus fruit and juice, and cereals and breads (including corn grits, corn bread and biscuits). These foods were consumed between .8 and 1.8 times per day. A core diet consisting of these foods plus 26 others contributed 69 percent of the calories consumed by the subjects. The core diet was divided into 6 major groups: snack items, meat, cereals, milk, fruit and fruit juice, and other beverages. The foods in each of the six groups and the calories they provided were as follows: snack items (bread, luncheon meat, lettuce, onion, tomato, cheese, peanut butter, jam and jelly, potato chips, cookies and fat, including butter, margarin, mayonnaise and sometimes gravy): 431 kcal; meat group (sausage, bacon, eggs and ground beef): 182 kcal; cereal group (corn grits, corn bread, biscuits and white potatoes): 313 kcal; milk group

(whole milk, low fat milk, evaporated milk, chocolate milk and ice cream): 360 kcal; fruit and fruit juice group (oranges, apples, bananas, citrus juice and other juices): 129 kcal; and beverage group (bottled soft drinks, Kool-Aid and coffee or tea): 122 kcal. This core diet was typical of a working mother's diet, who broughting their lunch to work and snacked frequently. A secondary food pattern consisted of 48 foods eaten once each 5-20 days. The secondary foods were generally richer in meat and reflected a different type of cooking and food service. The author did not specify what this difference was in cooking or food service. He suggested that these secondary foods might have come from a small heterogenous population that lived quite differently from the general population under study or that eating patterns varied during the week such as on weekends. Further examination of the food frequencies questionnaires suggested the latter theory. This conclusion was further justified, because the percentage of calories in the core and secondary diets was relatively constant when compared among subgroups (racial, age, counties, pregnant and non-pregnant).

Bruhn and Pangborn (26) interviewed 65 migrant families of Mexican descent and 26 families of Anglo heritage in three labor camps in California, to determine their food purchasing patterns, food preferences, and their desire for changing their food habits. Personal interviews were conducted in the homes of the surveyed families. An open ended questionnaire consisting of 100 questions about meal patterns, food likes and dislikes, food preparation practices, food purchasing patterns, food aversions and demographic variables was used by English and Spanish speaking interviewers. After the interview, an inventory of the foods in the household was taken and recorded by brand

and size.

Both the Mexican and Anglo groups had food habits which were similar due to the common constraints of low income. This was reflected in the high consumption of beans, white bread or tortillas. However there were also differences due to their respective ethnic groups. The Anglos reported pork chops, chicken, cornbread, biscuits, greens, beans, tacos and tortillas as being favorite foods while the favorite foods of the Mexicans were refried beans, tacos, hamburgers, macaroni and cheese, frankfurters and tuna fish. Favorite desserts for the Anglos were pie, ice cream and gelatin, while gelatin, fruit, cake and pudding were popular among the Mexican families. Anglo adults drank more coffee, tea and milk, while the Mexicans drank more carbonated beverages, Kool-Aid and beer with their meals. Soft drinks and coffee were popular between meal beverages for both groups. Foods that were consumed frequently (at least once a week) by the Anglos were milk, cheese, chicken, potatoes, white bread, hamburger and pinto beans. Refried beans and corn tortillas were served the most frequently by the Mexican families. Some of the foods mentioned as being liked, but not consumed very often were spare ribs, biscuits and sausage by the Anglo families, and tamales, empanadas, nopales, bunuelos, capirotada and pinole by the Mexican families. The reason for limited consumption of these foods could have been due to economic constraints or because these foods were associated with specific seasons or holidays.

Shopping practices were varied between the two groups with the Mexicans shopping once a week and the Anglos shopping every day. The meal that was most different between the two groups was breakfast. The Mexican families consumed a much larger breakfast consisting of eggs,

refried beans, bread or tortillas, cereal and a beverage. The Anglo families frequently consumed only a beverage for breakfast, which seemed to provide insufficant food for people doing manual labor. The desire to change was predicted by asking questions about having more or less time for meals and having more or less money. When asked about time, the wives of both groups stated that they would not spend more time on meals if it were available and that they would serve more canned foods and sandwiches if they had less time. If more money were available the wives indicated that they would buy more meat, while they would buy less meat and serve more low cost starchy foods if they had less money. However 23 percent of the families said that they would not change any habits if they had less money. This reflected the attitude that "food comes first in the family budget".

Schuck and Tartt (27) conducted a survey in July and August, 1969 in Bolicer, Leflore and Tallahatchie Counties, Mississippi. Information was obtained through home visits in 461 low-income rural Negro households and included: size of household, income, education, foods purchased and used, and food expenditures. A food list, used by trained interviewers, was employed to aid the respondents in recalling quantities of food bought and used, and food costs during the preceding seven day period.

Home produced foods contributed little at this low income level. Food stamps also had little effect, since only a small percent of the survey population participated in the Food Stamp Program. Meat and grains contributed the most to the caloric value of the foods, with meats sometimes exceeding grains, in the higher low income levels. No further report on food consumption was made.

Schuck and Tartt made several recommendations: a) an adult education program to cover the basics of elementary education that many of these people missed in their early youth followed by job training; b) child care centers so that mothers of young children could seek gainful employment outside the home and thus further increase the family income; c) continuing efforts to further industrial development in Mississippi to make more jobs available; d) greater home food production and wider use of food stamps and e) extension of educational activities by "nutrition aides" under the guidance of the Cooperative Extension Service.

Food preferences of 679 lower class sixth-grade children, particapating in school lunch programs and living in Florida (133 boys and 117 girls), Ohio (108 boys and 114 girls) and Texas (102 boys and 105 girls), were recorded by Zunich and Fults (28). The children were asked to indicate either like or dislike for 124 specific foods taken from the nutritional recommendations made by the Council on Foods and Nutrition of the American Medical Association.

A chi-square analysis failed to support the hypothesis that food preference are independent among children living in various areas of the country, suggesting that food preferences are dependent upon residence in a given geographic region. Beverages, desserts, fresh fruit, potatoes, meat and bread were most popular for all children, while cereals, fish and cooked vegetables were most frequently disliked by the whole group. Specific foods, such as hamburgers, ham, grapes, peaches, strawberries, watermelon, biscuits, doughnuts, cakes and cookies were liked by all the children. Foods with the largest number of dislikes were coffee, tea, veal cutlets, liver (baked), stewed

chicken, tuna fish, salmon loaf, baked fish, various kinds of cooked and raw vegetables (for example, beets, broccoli, cabbage, spinach, squash and carrots), cranberry sauce, dates, stewed prunes, canned pumpkin, prune juice, tomato juice, cream of wheat, oatmeal, molasses, custard pie and vegetable salads.

There was some similarity of food preferences between Florida and Texas children, while Ohio children had some different food preferences. More Ohio children disliked beverages (coffee and tea), cereals, desserts, canned fruit, meat, potatoes, salads and vegetables (cooked and raw) than did Florida and Texas children. Children from Florida and Texas had identical total percentages for food likes and dislikes, while Ohio children had lower percentage of food likes and a higher percentage of food dislikes. The researchers suggested that the differences could be attributed to the availability of foods. Children in Florida and Texas, due to warm climates and local availability of foods would be exposed to more foods over a longer period of time than Ohio children. This was suggested by the high frequencies of food likes by the Florida and Texas children for cooked and raw vegetables. The authors stated these findings might be helpful to elementary teachers, school lunch personnel, nutrition educators, Head Start personnel and others working with low-income families.

Sanjur and Scoma (23) surveyed 149 Black low-income families living in Upstate New York, who had preschool children in programs such as Head Start, Follow Through, day care centers, etc. Four Black female interviewers, who were selected by Cooperative Extension personnel, conducted the household surveys. A questionnaire to assess three dimensions (food consumption, food preferences and food belief) of

eating patterns of preschool children, consisted of 62 open- and closed-ended questions. Food consumption data were collected for both mother and child using the 24 hour recall method. Food preferences were assessed by asking each mother to indicate her child's attitude toward a list of 50 food items as to four categories "like", "dislike", "neutral" or "never tasted". Food belief information was obtained through open-ended questions, which were particularly relevant to the American Negro culture. The instrument also contained a number of socio-cultural questions.

The foods consumed most frequently by the mothers were: meat (93%), bread (88%), coffee (76%), potatoes (59%) and sandwiches (58%). Foods consumed most frequently by the preschool children were: milk (91%), meat (90%), bread (83%), cereals (69%) and green and yellow vegetables (68%). Diets were also divided into three levels similar to a Guttman scale. Level 1 included milk, bread, meat, cereals, coffee and potatoes. Level 2 included all foods in level 1 plus green and yellow vegetables, beverages, fruit and fruit juices, desserts, Kool Aid, eggs and other vegetables. Level 3 included foods in level 1 and 2 plus cornbread, macaroni, tea and spaghetti. Most of the survey population had diets in the level 2 category. The food preference data showed high agreement for both mother and child within the meat group and the bread and cereal group. There was a wide range of variation of food preference between the mother and child for the milk group and the vegetable and fruit group.

Using data from the 1977-78 Nationwide Food Consumption Survey, Peterkin et al. (29) examined food consumption behavior of 4,400 households eligible for the Food Stamp Program (FSP), especially 627

households with food costs at or near the food stamp allotment level (90 to 109% of the food stamp allotment). The diets of these households were classified as to whether or not they provided 80 percent or more of the RDA for 11 nutrients: protein, calcium, phosphorus, iron, magnesium, vitamin A, thiamin, riboflavin, vitamin B_6, vitamin B_{12} and vitamin C. Food consumption patterns of 210 households that met 80 percent or more of the RDA for all 11 nutrients were compared with 417 households whose food intake did not meet that criteria.

Households that met the 80 percent RDA criteria alloted more of the food dollar to milk and dairy products; eggs, dry legumes, and nuts; vegetables; fruit; and grain products, and less of the food dollar to meat, poultry, and fish; soft drinks; and alcoholic beverages than households that did not meet the criteria. The two groups used about the same amount of the food dollar for oils, sugars and sweets. Household diets that met the criteria contained larger quantities of most food groups, especially more milk, vegetables and grain products than households diets that failed to meet the criteria. Exceptions were meat, poultry, and fish; soft drinks, ades, dessert mixes, and powdered desserts; and alcoholic beverages, which were consumed less by the households that met the criteria than those that did not.

Cronin (30) compared data from low income households in the 1965 and 1977-78 Nationwide Food Consumption Surveys, and found that the use of foods from the milk group and the bread and cereal group had declined from 1965 to 1977-78. The consumption of foods from the meat, poultry, fish and bean group had increased generally during the period, however eggs and beans were consumed less, while pork, poultry, fish and luncheon meat were consumed more often in 1977-78 than in 1965. The

consumption of foods from the fruit and vegetable group, especially citrus fruit and juices and dark green and deep yellow vegetables was higher in 1977-78 than in 1965. The author did not give any other specific details about the changes in the food pattern of low income households.

Overall, the food consumption studies of low income individuals cited above show foods consumed most frequently were milk, coffee, cereals, breads (cornbread), meats (hamburger, chicken and tuna), potatoes and beans. The most liked foods were desserts, fresh fruits, potatoes, meat and breads, while those foods disliked were cereals, fish, cooked vegetables and liver. Also families with diets of good nutritional quality consumed more eggs, milk, grains, nuts, dry legumes, fruit and vegetables, and consumed less meat, poultry, fish, alcohol and soft drink than families with poorer quality diets. Low income individuals tend to consume less expensive foods such as beans, grains, eggs and cheaper meats.

METHODOLOGY

Source of Data

The data used in this project were from the low-income household and low-income individual surveys which were supplements to the Nationwide Food Consumption Survey (NFCS) 1977-78. The low-income household and individual surveys were conducted in November 1977 through March 1978. The NFCS used a stratified area probability sample of low-income households and low-income individuals in the 48 contiguous states of the United States. Seven tapes of original data were obtained from the Consumer Nutrition Center (CNC). The tapes contained socio-economic factors as well as dietary data from 4,700 low-income households (31) and 12,000 low-income individuals (32). The dietary data consisted of a 24-hour dietary recall and two dietary intake records taken on each individual in the household. Each individual was classified according to their nutritional adequacy and income level. For this study data from the North Central Region, including Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin were analyzed.

Data Management

Data management was a major factor in the initial phase of this project. Initially, a list of socio-economic and dietary variables taken from the Household Manual and Individual Manual (Appendix B-1) were selected for analysis. When the final work tape file was created some variables that were initially included were deleted because they were in an unusable form on the tapes. The seven original tapes from CNC were copied onto four new tape files, A, B, H and J, (Appendix A-2 and A-3), which conserved time and money, because the four new working

tape files contained only the records that would be needed for the analysis. These working tapes contained data only from those individuals with averages of 3-day dietary intakes. The three-day averages consisted of the 24-hour dietary recall and both dietary intake records summed and averaged for all individuals.

The next step in the data management was to make a separate file of each record type. This was done as shown in Appendix A-2 and Appendix A-3. These 15 separate tape files, coded alphabetically L-Z, were merged at different times and in different combinations to obtain the information needed as the analysis proceeded.

Calculation of Nutrient Adequacy Ratios (NARs)

Several of the working tape files were merged to obtain the information needed for calculationg NARs (Appendix A-4). Age, sex and amounts of 13 nutrients consumed were needed for the calculations. The 13 nutrients were food energy, protein, calcium, iron, magnesium, phosphorus, vitamin A, thiamin, riboflavin, niacin, vitamin B_6, vitamin B_{12}, and vitamin C. The amounts for each of these nutrients were taken from the 3-day average, which had been calculated on the original data tapes. Values for the recommended dietary allowances for each age, sex, pregnant and lactating group for all 13 nutrients were added into the program (Appendix A-4). NARs were obtained for all 13 nutrients for each individual. The formula for NAR is as follows:

$$\text{NAR} = \frac{\text{amount of nutrient in diet}}{\text{RDA of nutrient}} \times 100$$

All NAR values were truncated at 100.

Calculation of Mean Adequacy Ratios (MARs)

To determine the MAR for each individual, the NAR for all 13 nutrients were summed and divided by 13. The formula for MARs is as follows:

$$\text{MAR} = \frac{\text{Sum of 13 NARs for each individual}}{13} \times 100$$

Determination of Income Level

Income was merged onto a tape file with family size (Appendix A-5). Relationship of income to the poverty level was determined using standards published by the U.S. Dept. of Commerce (33, 34). The standards used to determine the poverty level are listed in Table 1. Percent of the poverty level was calculated using the following formula:

$$\% \text{ Poverty Level} = \frac{\text{Income of Household}}{\text{Poverty Level Based On Family Size}} \times 100$$

Each individual in a household was be classified according to the household poverty level. At this point 107 households were deleted, because their reported income was greater than $24,000.

Merging Income Files With MAR Files to Form MAR-Income Groups

The income and MARs files were merged (Appendix A-6), after which the sample size was 11,511. The sample size decreased because some individuals with 3-day dietary intakes lived in households which had incomes greater than $24,000. The sample was then classified on the basis of Income and MAR level. Income was divided into a Low Low-Income group with income less than or equal to 100 percent of the poverty level and a High Low-Income group with income

Table 1 Standards for poverty level

family size	income[a]
1	3,185
2	4,077
3	4,992
4	6,393
5	7,556
6	8,517
7 or more	10,532

[a]Average of years 1977 and 1978 poverty levels (32,33)

greater than 100 percent of the poverty level. MARs were divided into a High MAR group with MAR levels greater than or equal to 80 and a Low MAR group with MAR levels less than 80. The High Low-income and Low MAR group were labeled negative deviants because they unexpectedly had low nutritional status for their income level. The Low Low-income and High MAR group were labeled positive deviants because they had unexpectedly high nutrient intake given their low income.

Classification of Foods into 38 Food Groups

Foods consumed by the low-income individuals were classified into 38 food groups (Appendix A-7). This typology of food groups was defined by the minor food subgroups already identified by the NFCS 1977-78 (Table 2). All baby foods were deleted from the analysis.

Merging 38 Food Groups with Classified Individuals

Data for each individual, classified into one of four MAR-income groups were merged with that individuals's food intake data classified by food subgroups (Appendix A-7). After this merger, sample size was reduced to 11,425 because those individuals who ate only baby foods were deleted from further analysis.

Merging Tape Files to Obtain Socio-Economic Variables

The tapes with food and income data were merged with the selected socio-economic variables (Appendix A-8, A-9 and A-10). The socio-economic variables of interest were sex, use of food stamps, growing own fruits and vegetables, raising own animals, freezing own food, canning own food, living on a farm, education of female head of household, race, shopping frequency, kind of store, length of time in dwelling, tenancy, usual food preparer, usual food shopper and benefits from WIC.

Table 2 Definition of 38 food groups

food group	minor food subgroup included[a]
1. milk	111[b] milk, fluid-pasteurized, filled, buttermilk, dry reconstituted
	112 milk, concentrated fluid
	113 milk, imitation
	114 yogurt
	115 chocolate, malted, shakes, other flavored milk drinks
	116 meal replacements with milk
	118 milk, dry and powdered mixtures with dry milk, not reconstituted
	121 sweet dairy cream (fluid whipped or dry)
	122 sweet cream and whipped cream substitutes
	123 sour dairy cream
2. milk desserts	131 milk desserts, frozen
	132 milk desserts, not frozen
	134 milk sauces and gravies
	135 other milk products
3. cheeses	141 natural cheese
	142 cottage cheese
	143 cream cheese
	144 processed cheeses and cheese spreads
	145 imitation cheese
	146 cheese mixtures
	147 cheese soups
4. beef	210 meat, nfs, and beef, nfs,
	211 beef steak with bone
	212 beef steak without bone
	213 beef cuts with bone, not steaks
	214 beef slices or chunks
	215 ground beef patties, meat balls
	216 other beef items
5. pork, lamb, veal	220 pork, nfs
	221 pork chops
	222 pork steak or cutlet
	223 ham
	224 pork roasts, or ham
	225 canadian bacon
	226 bacon and salt pork, fat back
	227 misc. pork cuts
	230 lamb, nfs
	231 lamb

Table 2 Definition of 38 food groups

food group	minor food subgroups included
	232 veal
	233 game
6. poultry	241 chicken
	242 turkey
	243 duck
	244 rock cornish game hen and other poultry
7. variety meat	251 organ meats and mixtures
	252 frankfurters, sausages, lunchmeats, meat spreads
8. fish and shellfish	261 finfish
	262 other seafood
	263 shellfish
9. meat mixture	271 meat, poultry or fish in gravy, sauce, or creamed
	272 meat, poultry or fish combined with starch items
	273 meat, poultry or fish with starch and vegetable
	274 meat, poultry or fish with vegetable, excluding white potatoes
	275 sandwiches with meat
	281 frozen plate meals
	283 soups, broths, extracts, from meat, poultry or fish base
	284 gelatin drink, plain
	285 gravies, meat or poultry base made with water
10. eggs	311 chicken eggs
	312 other poultry eggs
	321 egg dishes
	322 egg sandwiches
	323 egg soups
	324 meringues
	330 substitutes, nfs
	331 made from powdered mixtures
	332 made from frozen mixtures
	333 made from liquid mixtures

Table 2 Definition of food groups

food group	minor food subgroup included
11. legumes	411 cooked or canned dried beans
	412 cooked or canned dried bean mixture
	413 cooked dried peas, and lentils mixture
	414 soybean dried products
	415 frozen meals with dried beans or peas as main course
	416 soups, mainly legumes
	418 meat substitutes
	419 meat substitutes sandwiches
12. nuts, nut butters, seeds, carob	421 nuts
	422 nut butters
	423 nut butter sandwiches
	424 coconut beverages and mixtures
	425 nut mixtures
	431 seeds
	441 carob powders
	442 carob chips
13. flour	500 flour and dry mixes
14. breads	510 breads, rolls, nfs
	511 white bread, rolls
	512 whole wheat bread, rolls
	513 cracked wheat bread, rolls
	514 rye bread, rolls
	515 oatmeal bread
	516 multigrain bread
	517 cottonseed bread
	518 other breads
15. quick breads, pies, cakes, cookies, pastry	521 biscuits
	522 cornbread and corn muffins
	523 other muffins, popovers
	524 quickbreads excluding cornbread and muffins
	531 cakes
	532 cookies
	533 pies
	534 cobblers, eclairs, turnovers, other pastries
	535 danish, breakfast pastries, bars, and doughnuts
	536 coffee cake, not yeast type
	551 pancakes
	552 waffles

Table 2 Definition of food groups

food group	minor food subgroup included
	553 french toast
	554 crepes
	555 flour water patties
	556 flour milk patties
	557 rice flour cakes
16. crackers and snacks from grain	541 sweet crackers
	542 low sodium (dietary) crackers
	543 non-sweet crackers
	544 salty snack products from grain sources
17. cooked pasta and cereal	561 pastes
	562 cooked cereals
18. ready-to-eat-cereals	571 buckwheat cereals
	572 bran cereals
	573 corn cereals
	574 oat cereals
	575 rice cereals
	576 wheat cereals
	577 multigrain cereals
	578 other cereals
19. grain mixtures	581 mixtures with animal protein
	582 mixtures without animal protein
	583 frozen plate meals
	584 soups with grain products as main ingredient
20. citrus fruit and juices	611 citrus fruits
	612 citrus fruit juices
21. other fruit	621 dried fruit
	631 fruit, exclude berries
	632 berries
	633 mixtures of 2 or more fruits
	634 mixtures of fruits, berries and non-fruit items
	641 juices
	642 nectars
22. white potatoes	710 white potatoes, nfs
	711 baked, boiled, canned
	712 chips, sticks
	713 creamed, scalloped, au gratin
	714 fried
	715 mashed, stuffed, puffs

Table 2 Definition of food groups

food group	minor food subgroups included
	716 salad
	717 special recipes
	718 soups
	719 puerto rican starchy vegetables
23. dark green vegetable	721 dark green leafy vegetable
	722 dark green, not leafy vegetable
	723 dark green vegetable soups
24. deep yellow vegetable	731 carrots
	732 pumpkin
	733 squash
	734 sweet potatoes
	735 deep yellow vegetable soups
25. tomatoes	741 raw tomatoes
	742 cooked tomatoes
	743 tomato juice
	744 tomato sauces
	745 tomato mixture
	746 tomato sandwiches
26. other vegetables	751 raw vegetables
	752 cooked or canned vegetables with or without added fat
27. vegetable mixture	753 cooked vegetable, mixture of two or more vegetables (include nuts) with or without added fat
	754 cooked vegetables with sauces, batters, casseroles
	755 olives, pickles, relishes (exclude tomatoes)
	756 vegetable soups
28. vegetable mixture with animal protein	771 white potato mixtures
	772 puerto rican starchy vegetable (viandas) mixtures
	773 other vegetable mixtures
	775 puerto rican stews or soups with starchy vegetables (viandas)
29. table fat	811 table fats
30. cooking fats and oil	812 cooking fats
	813 other fats
	821 vegetable oils
	009 cooking oils, sprays or sticks

Table 2 Definition of food groups

food group	minor food subgroups included
31. salad dressing	831 regular type 832 low-calorie type
32. sugar	911 sugars 912 sugar replacements or substitutes 913 syrups, honey, molasses 914 jellies, jams, preserves
33. sugar products	915 gelatin desserts, salads 916 ices, popsicles 917 candies 918 chewing gum and cough drops
34. coffee and tea	921 coffee 922 coffee substitues 923 tea
35. other non-alcoholic beverages	924 soft drinks 925 fruitades and drinks 926 non-fruit beverages 929 sugar concentrate with vitamin C, powdered not reconstituted
36. alcoholic beverages	931 beers and ales 932 cordial and liqueurs 934 wines 935 distilled liquors
37. non-food miscellaneous	001 artificial sweeteners 002 extracts, flavors, vinegar 003 seasonings, spices, herbs
38. vitamins and minerals	004 vitamins, minerals, supplements

[a]Minor food subgroups taken from the Nationwide Food Consumption Survey, 1977-78.

[b]Number refers to code number assigned by the Nationwide Food Consumption Survey, 1977-78.

Creation of Final Tape File

The final tape file was created from a merger of the socio-economic tapes and the MAR-income tapes (Appendix A-10). This tape file consisted of a sample size of 11,425, however when the variable use of food stamps was included in the analysis the sample size was reduced to 11,330, because 95 subjects did not answer questions about food stamps.

For this research only those individuals who lived in the North Central Region (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakato and Wisconsin) were included in the analysis. The number of survey individuals who lived in this region was 1,346. When the food stamp variable was included the sample size decreased to 1,337. All statistical analysis were preformed on this set of individuals.

Statistical Analysis of Data

Steps taken in the statistical analysis of the data are shown in Appendix C. Frequencies were obtained for all socio-economic variables (Appendix C-1). Means and standard deviations were calculated for the amounts of foods consumed from each of the 38 food groups for each MAR-income group.

The remaining statistical analysis involved the use of multivariate and discriminate techniques to identify significant patterns and associations between and among the four MAR-income groups.

Multivariate Analysis of Variance

Multivariate analysis of variance was performed on the four MAR-income groups using the amounts consumed of all 36 food groups as multivariate dependent variables (Appendix C-1). Two food groups,

vegetable mixture with protein and vitamin-mineral supplements were deleted from the analysis because reported consumption from these food groups was not found on our tapes. The mean for each MAR-income group consisted of the average amount of each food group consumed by all individuals belonging to that specific MAR-income group. The multivariate analysis of variance was used to determine whether there was a significant difference between the mean amounts. The SAS analysis of variance procedure, PROC ANOVA, was used with the multivariate option, MANOVA (35,36). Mean separation of the amounts of each food group consumed by each of the four MAR-income group was determined by the DUNCAN option which applied the Duncan test (35,37).

Stepwise Discriminate Analysis

The MAR-income group to which the individual belongs may influence the amount of food consumed by that individual from certain food groups. Socio-economic variables may also influence the MAR-income group to which the individual belongs. A stepwise discriminate analysis process was selected to identify foods and socio-economic variables associated with each MAR-income group (38,39,40). If the contribution of a variable to the discriminate process is relatively high it is very likely that the variable can be used to predict the MAR-income group to which an individual belongs.

A SAS procedure, PROC STEPDISC, was used to build a discriminate function in stepwise fashion (35). This permitted the creation of an optimal set of independent variables that would discriminate between the four MAR-income groups. Two criteria were necessary for inclusion in the optimal set of variables: 1) partial R^2 associated with each

variable and 2) whether the variable made a significant contribution to the discriminate function. PROC STEPDISC also was used to eliminate those variables that were not useful in the discrimination process. Variables were eliminated if they did not have a partial R^2 greater than .02 and an alpha level of .001 or less.

Since the food groups were used to construct the MARs they might mask the influence of the socio-economic variables. Thus, the analysis was done with the food groups and socio-economic variables separately and combined. All together eight different stepwise discriminate analysis were performed. Four stepwise discriminate analysis were performed with the partial R^2 criteria and the same four were performed with the significant level criteria. The four PROC STEPDISC had the same dependent variables, the four MAR-income groups. The independent variables differed in each analysis. The first group consisted of all 36 food groups and age. The second analysis consisted of all 36 food groups, age, sex and food stamps. The third analysis consisted of age, sex, food stamps, growing own fruit and vegetables, raising own animals, freezing own food, canning own food, living on farm, education of female head of hoousehold, race, shopping frequency, kind of store, size of family, length of time in dwelling, tenancy, usual food shopper and benefits from WIC. The fourth analysis consisted of all 36 food groups and all other variables found in the third analysis.

All dependent variables used in PROC STEPDISC were either continuous or coded with dummy variables. A small alpha level (.001) was needed for the significant level criteria because of the large sample size. The results of PROC STEPDISC using a partial R^2 of .02 was not influenced by sample size, therefore the variables chosen by this

method were given added weight when interpreting results of the analysis.

Discriminate Analysis

The SAS procedure, PROC DISCRIM, (41) was used to determine how well the dependent variables, found to be important in the STEPDISC discriminate analysis, could correctly classify an individual into their MAR-income group. Two discriminate analysis were performed using MAR-income group as the independent variable and different combinations of the dependent variables (Appendix C-3).

RESULTS AND DISCUSSION

Descriptive Analysis

The 1346 low income individuals from the 1977-78 Nationwide Food Consumption Survey, North Central Region, were classified according to the nutritional adequacy of their dietary intake and income, (Table 3). The nutritional adequacy of an individual was defined either as less than .80 MAR or greater than or equal to .80 MAR. The individuals were also divided into two income categories; less than or equal to 100% of the poverty level or greater than 100% of the poverty level. Group 1 (N=350) consisted of those individuals with low MAR and low-low income. Group 2 (N=107), known as the negative deviant group consisted of low MAR and high-low income individuals. The positive deviants were group 3 (N=673) and consisted of high MAR and low-low income individuals. Group 4 (N=216) consisted of high MAR and high-low income individuals. Group 2 was called the negative deviant group because these individuals had a higher low income but unexpectedly low MARs. The positive deviants were opposite, because they had lower income, but higher MARs. The differences among these groups were described according to several criteria; sex, age, family size, income, shopping frequency, tenancy, length of time in dwelling, type of store where food is usually purchased, the person who usually prepares and shops for food, growing food for household consumption, canning food for household consumption, freezing food for household consumption, raising food animals for household consumption, participation in various food aid programs, race of individual, whether they do any farming and education of the female head of the household. Table 4 lists these variables and the

Table 3 Classification of the low income subset of the 1977-78 Nationwide Food Consumption Survey, Northcentral region, by nutritional adequacy of dietary intake and income

adequacy of dietary intake	income		
	≤ 100% poverty level	> 100% poverty level	total
MAR < .80	350	107[a]	457
MAR ≥ .80	673[b]	216	889
total	1023	323	1346[c]

[a]negative deviants
[b]positive deviants
[c]10 missing observations, due to deleting infant foods from data set

Table 4 Descriptive data of the low-income subset of the 1977-78 Nationwide Food Consumption Survey, using several different criteria

criteria	1[a]	2[b]	3[c]	4[d]
sex				
female	62%	76%	53%	43%
male*	38%	24%	47%	57%
mean age				
female	33	30	25	25
male*	27	40	19	25
race				
white*	41%	58%	32%	61%
black*	56%	41%	66%	33%
other	3%	1%	2%	6%
mean income*	$1894[e]	$3562[f]	$2058[e]	$3924[g]
mean family size	5	4	5	4
length of time in dwelling				
≥ 12 months	80%	77%	76%	78%
< 12 months	20%	23%	24%	22%
tenancy				
own*	25%	58%	30%	51%
rent*	75%	42%	70%	48%
type of store				
supermarket	96%	96%	94%	95%
frequency of shopping				
> once a week	15%	10%	10%	13%
once a week*	27%	53%	35%	55%
once every two weeks*	33%	20%	32%	20%
once a month	25%	17%	23%	12%
usual shopper of food				
female head of household*	76%	63%	78%	63%
male head of household	8%	12%	7%	12%
other	16%	25%	15%	25%
usual preparer of food				
female head of household	85%	85%	86%	91%
male head of household	4%	5%	3%	2%
other	11%	10%	11%	7%
growing food*	21%	32%	23%	36%
freezing food*	32%	60%	39%	49%
canning food*	14%	38%	17%	34%
raising food animals	3%	4%	3%	4%
farming	1%	3%	1%	3%
education of female head of household				
< high school education	35%	25%	30%	80%
≥ high school education	65%	75%	70%	20%

Table 4 Descriptive data of the low-income subset of the 1977-78 Nationwide Food Consumption Survey, using several different criteria

criteria	1[a]	2[b]	3[c]	4[d]
participating in WIC*	13%	6%	14%	5%
participating in School Breakfast*	6%	0%	33%	0%
participating in School Lunch	82%	80%	86%	90%
participating in Food Stamp*	70%	20%	68%	24%
receiving				
< 9 months*	10%	50%	13%	63%
> 10 months*	90%	50%	87%	37%

[a]low MAR, low-low income group
[b]low MAR, high-low income group (negative deviants)
[c]high MAR, low-low income group (positive deviants)
[d]high MAR, high-low income group
[e]range 0 - $7200
[f]range $1620 - $18,000
[g]range $1620 - $12780
*the difference between group 2 and group 3 has a significance level < .001

percentage or means of the individuals from each MAR-income group with these characteristics.

The similarities between the positive and negative deviant groups were in the kind of store where food was usually purchased, length of time in dwelling, family size, the person who usually prepared the food, farming, raising food animals for household consumption, participation in school lunch program and the education of the female head of the household. These similarities had chi-square values of greater than .1, which showed there was not a difference in the four MAR-income groups.

There was a significant difference between the positive and negative deviant groups in several areas. Characteristics of the negative deviants were: more females than males, a higher mean age for the males, a higher mean income, more often owners of homes than renters, more often white, shopped for food more frequently, less often the shopper of food was the female head of the household, more likely to grow, freeze, and can food for household consumption, and less likely to participate in WIC, the school breakfast program, and the food stamp program. The positive deviant group had the characteristics: more males than females, a lower mean age for males, a lower mean income, a higher percent of blacks, more renters, shopped for food less frequently, more often the shopper of food was the female head of household, had fewer individuals who grew, canned, or froze food for household consumption, more likely to participate in WIC, the school breakfast program, the food stamp program, and received food stamps for a longer period of time. A chi-square analysis showed a significant difference (p value $< .001$) in these variables between the four MAR-

income groups.

Analysis of Variance

The mean amount consumed of each of the 36 food groups is recorded in Table 5. To determine how these mean amounts were different according to the 4 MAR-income groups a Duncan Multiple Range test was performed (Table 5). For example milk (Table 5) has the same letter A under group 1 and group 2 and the same letter B under group 3 and group 4. This means that group 1 and 2 consumed similar amounts of milk, as did groups 3 and 4. However, there was a significant difference between the amount of consumption between groups 2 (negative deviant) and 3 (positive deviants). The results from the analysis of variance showed all food groups, except cheese; poultry; flour; crackers and snacks from grain; vegetable mixtures; cooking fat and oil; alcoholic beverages and non food miscellaneous had a difference in consumption rate that was significant at the p value < .01 (Table 6). This meant that there was a difference in consumption rate between the 4 MAR-income groups.

The positive and negative deviants showed no differences in their consumption of cheese; poultry; fish and shellfish; flour; crackers and snacks from grain; vegetable mixture; table fat; cooking fat and oil; salad dressing; sugar products; other non-alcoholic beverages; alcoholic beverages and non-food miscellaneous. The positive and negative deviants consumed different amounts of the following food groups: milk; milk desserts; beef; pork, lamb and veal; variety meats; meat mixture; eggs; legumes; nuts, nut butters, carob and seeds; breads; quick breads, cakes, pies, cookies and pastry; cooked pasta and cereal; ready-to-eat-cereal; grain mixture; citrus fruit and juices; other fruit; white potatoes; dark green vegetables;

Table 5 Mean amounts consumed of the 36 food groups by each of the four MAR-income groups

food group	mean amount consumed[a]			
	1[b]	2[c]	3[d]	4[e]
1. milk	428.39	426.76	1147.36	1252.46
	A[f]	A	B	B
2. milk desserts	18.05	19.24	37.71	40.96
	A	A	B	B
3. cheese	12.66	22.90	21.22	25.78
	A	A	A	
		B	B	B
4. beef	65.48	73.45	106.80	98.94
	A	A	B	B
		C		C
5. pork, lamb, veal	69.64	56.21	102.23	70.37
	A		A	A
6. poultry	78.14	71.08	97.01	96.06
	A	A	A	A
7. variety meats	63.42	51.60	88.19	95.05
	A	A	B	B
8. fish and shellfish	15.30	37.70	27.04	39.26
	A		A	
		B	B	B
9. meat mixtures	169.62	131.76	219.56	216.33
	A	A		
	B		B	B
10. eggs	78.76	66.48	105.90	101.82
	A	A	B	B
11. legumes	65.28	36.86	77.00	40.52
	A	A		A
	B		B	
12. nuts, nut butters, seeds, carob	4.78	2.77	11.88	11.76
	A	A	B	B
13. flour	.00	.00	.05	2.14
	A	A	A	
14. breads	142.81	148.86	206.59	201.20
	A	A	B	B

Table 5 Mean amounts consumed of the 36 food groups by each of the four MAR income groups

food group	mean amounts consumed			
	1	2	3	4
15. quick breads, cakes cookies, pies, pastry	94.71 A	73.92 A	167.18	131.44
16. crackers and snacks from grain	10.18 A	6.98 A	13.52 A	12.21 A
17. cooked pasta and cereals	155.01 A	119.74 A	231.56	147.42 A
18. ready-to-eat-cereals	14.99 A	13.16 A	43.44 B	37.56 B
19. grain mixture	132.42 A	163.75 A	224.54 B	252.30 B
20. citrus fruit and juices	111.12 A	126.99 A	215.74 B	238.72 B
21. other fruit	58.02 A	88.63 A	130.62	208.66
22. white potatoes	114.14 A	136.74 A	180.27	220.29
23. dark green veg.	15.60 A	19.20 A	72.10	26.94 A
24. deep yellow veg.	13.29 A	7.40 A	28.62 B	20.16 A B
25. tomatoes	20.88 A C	18.02 A	39.82 B C	45.86 B
26. other veg.	108.10 A	130.45 A	167.76	223.16
27. veg. mixture	45.64 A	60.41 A	59.84 A	63.37 A
29. table fats	9.74 A	13.44 A B	15.06 B	19.44

Table 5 Mean amounts consumed of the 36 food groups by each of the four MAR income groups

food group	mean amounts consumed			
	1	2	3	4
30. cooking fat and oil	1.08	.04	.30	.62
	A		A	A
		B	B	B
31. salad dressing	3.31	8.92	7.13	5.36
	A	A	B	B
		C	C	
32. sugar	26.99	26.88	44.14	34.42
	A	A	B	B
33. sugar products	10.24	34.56	23.43	40.36
	A	B	A	B
		C	C	
34. coffee and tea	750.53	1175.04	481.32	725.42
	A			A
35. other non-alcoholic	525.25	777.78	696.36	575.53
beverages	A	B	B	A
			C	C
36. alcoholic beverages	65.74	79.58	70.16	47.85
	A	A	A	A
37. non- food misc.	.02	.00	.36	.00
	A	A	A	A

[a]amounts measured in grams
[b]low MAR, low income
[c]low MAR, high low income (negative deviants)
[d]high MAR, low income (positive deviants)
[e]high MAR, high low income
[f]means in a row sharing a common letter are not significantly different ($p > .01$) using Duncan's Multiple Range test

Table 6 Results of the analysis of variance preformed on the 36 food groups with the four MAR-income groups as the dependent variable

food group	P value
1. milk	.0001
2. milk desserts	.001
3. cheese	.0164*
4. beef	.0001
5. pork, lamb, veal	.0001
6. poultry	.0328*
7. variety meats	.0001
8. fish and shellfish	.0022
9. meat mixture	.0034
10. eggs	.0002
11. legumes	.0092
12. nuts, nut butters, carob, seeds	.0001
13. flour	.0176*
14. breads	.0001
15. quick breads, cakes, pies, pastry	.0001
16. crackers and snacks from grain	.0552*
17. cooked pasta and cereal	.0001
18. ready-to-eat-cereal	.0001
19. grain mixture	.0001
20. citrus fruit and juices	.0001
21. other fruit	.0001
22. white potatoes	.0001
23. dark green vegetables	.0001
24. deep yellow vegetables	.0009
25. tomatoes	.0031
26. other vegetables	.0001
27. vegetable mixtures	.4765*
29. table fat	.0001
30. cooking fat and oil	.0345*
31. salad dressing	.0007
32. sugar	.0001
33. sugar products	.0001
34. coffee and tea	.0001
35. other non-alcoholic	.0014
36. alcoholic beverages	.9052*
37. non-food miscellaneous	.0595*

*p value > .01

deep yellow vegetables; tomatoes; other vegetables; sugar and coffee and tea. In all cases, except coffee and tea, the positive deviants consumed more of these food groups then the negative deviants. The negative deviants consumed more coffee and tea then the positive group.

Peterkin et al. (29), concluded from their data analysis in the 1977-78 Nationwide Food Consumption Survey, that low income individuals whose diets contained 80 percent of the RDA criteria consumed larger amounts of most food groups, especially milk, vegetables and grain products than those whose diet contained less than 80 percent of the RDA. Their results are in agreement with those of the present study. However, meat, poultry, fish, soft drinks, ades, dessert mixes, powdered desserts and alcoholic beverages were consumed in larger amounts by Peterkin's group then by individuals in this study. This may be explained by the fact that the present study only included those individuals in the North Central Region of the United States, while Peterkin et al. used individuals from all four regions of the United States. The lack of agreement also may be explained by the different way the foods were classified into food groups. For example dessert mixes were included in either the milk dessert group, quick breads, cakes, cookies, pies and pastry group, or sugar products group in this study, but were a separate food group in Peterkin's study. Smith et al. (42) used the same methodology and analysis, as was used in the current study, for her study of the 1977-78 Nationwide Food Consumption Survey. She, however included 11,000 low income individuals from the entire United States. The results from her study were also similar to the present study, where the positive deviants consumed more of all 36 food

groups, except coffee and tea, than the negative deviants. The Anglos in the study by Bruhn and Pangborn (26) consumed milk, cheese, chicken, potatoes, and white bread most frequently, which was similar to the findings in the present study. The consumption pattern of the Mexican subjects differed from that of individuals in the present study in that refried beans and corn tortillas were consumed most frequently. However there was no reported attempt to determine the nutritional adequacy of the diets of the Anglo or Mexican subjects, making comparisons with this study difficult.

Another way to look at the mean amounts consumed is to classify the food groups into expected and unexpected results. Expected results would be that the high MAR, high low income group consumed the largest amount of a food group and that the low MAR, low income group would consume the lowest amount of a food group. Unexpected results would be that the high MAR, low income group consumed the largest amounts of a food group and that the low MAR, high low income group would consume the lowest amount of a food group.

Table 7 lists the mean amounts of the food groups classified into unexpected and expected results. Milk desserts had an expected result because the lowest consumption was in group 1 and the highest consumption was in group 4. Pork, lamb and veal had unexpected results because the lowest consumption was in group 2 (negative deviants) and the highest consumption was in group 3 (positive deviants).

Food groups with expected results were milk desserts; fish and shellfish; grain mixture; citrus fruit and juices; other fruit; white potatoes; other vegetables; sugar products and table fat. Food groups with unexpected results were pork, lamb and veal; meat mixtures; eggs;

Table 7 The 36 food groups classified according to expected and unexpected results

food group	MAR-income groups			
	1[a]	2[b]	3[c]	4[d]
1. milk		L[e]		H[f]
2. milk desserts*	L			H
3. cheese**				
4. beef	L		H	
5. pork, lamb and veal***		L	H	
6. poultry***		L	H	
7. variety meat		L		H
8. fish and shellfish*	L			H
9. meat mixture***		L	H	
10. eggs***		L	H	
11. legumes***		L	H	
12. nuts, nut butters, carob, seeds***		L	H	
13. flour**				
14. bread	L		H	
15. quick breads, cakes, pies ect.***		L	H	
16. crackers and snack from grain**				
17. cooked pasta and cereal***		L	H	
18. ready-to-eat-cereal***		L	H	
19. grain mixture*	L			H
20. citrus fruit and juices*	L			H
21. other fruit*	L			H
22. white potatoes*	L			H
23. dark green vegetables	L		H	
24. deep yellow vegetables***		L	H	
25. tomatoes		L		H
26. other vegetables*	L			H
27. vegetable mixture***				
29. table fat*	L			H
30. cooking fat and oil**				
31. salad dressing	L	H		
32. sugar***		L	H	
33. sugar products*	L			H
34. coffee and tea		H	L	
35. other non-alcoholic beverages	L	H		
36. alcoholic beverages**				
37. non-food miscellaneous**				

[a]low MAR, low income
[b]low MAR, high low income (negative deviants)
[c]high MAR, low income (positive deviants)
[d]high MAR, high low income
[e]lowest consumption
[f]highest consumption
*expected results **not significantly different ***unexpected results

legumes; nuts, nut butters, carob and seeds; quick breads, cakes, cookies, pies and pastry; cooked pasta and cereal; ready-to-eat-cereal; deep yellow vegetables and sugar.

Some food groups did not follow the pattern of the expected or unexpected results. Beef, bread and dark green vegetables were expected to be consumed in the lowest amount by the low MAR, low income group. However these same food groups were unexpectedly consumed in the highest amount by the high MAR, low income group. Milk, variety meat and tomatoes were expectedly consumed in the highest amount by the high MAR, high low income group, and unexpectedly consumed in the lowest amount by the low MAR, high low income group. These results are also listed in Table 7.

The 36 food groups were collasped into seven major food groups: milk and milk products; meat; meat alternatives; breads and cereals; fruits and vegetables; fats; and sugar and non-alcoholic beverages. The 36 food groups were collasped so that comparisons could be made between this study and others. Table 8 shows the seven food groups with mean amounts consumed from each MAR-income group and what percentage that particular food group represented in the total diet. For example the milk and milk products group was consumed in a larger amount by group 3 (1206.29 grams) and group 4 (1319.20 grams) then by group 1 (459.10 grams) and group 2 (468.90 grams). Also the milk and milk products group made up a larger percent of the total diet in group 3 (29.17%) and in group 4 (28.70%) then in group 1 (17.11%) and in group 2 (15.77%). In addition sugar and non-alcoholic beverages were consumed in the highest percentage (21-28%) by the lower MAR groups. Regardless of income, those MAR-income groups with the higher MARs consumed more food

Table 8 Mean amounts consumed of the 36 food groups, which have been regrouped into seven major food groups

food group		MAR-income groups				
		1[a]	2[b]	3[c]	4[d]	total
milk and milk products	row%	13.30	13.58	34.92	38.20	100.00
	col%	17.11	15.77	26.17	28.70	-
	grams	459.10	468.90	1206.29	1319.20	3453.49
meat	row%	21.57	19.71	29.94	28.78	100.00
	col%	17.20	14.19	13.90	13.40	-
	grams	461.60	421.80	640.83	616.01	2140.24
meat alternative	row%	24.65	17.57	32.26	25.52	100.00
	col%	5.55	3.57	4.23	3.35	-
	grams	148.82	106.11	194.78	154.10	603.81
breads and cereals	row%	20.02	19.16	32.28	28.54	100.00
	col%	20.50	17.71	19.23	17.06	-
	grams	550.12	526.41	886.88	784.27	2747.68
fruits and vegetables	row%	16.14	19.49	29.66	34.71	100.00
	col%	18.14	18.78	19.41	22.79	-
	grams	486.79	587.84	894.77	1047.16	3016.56
fats	row%	16.73	26.53	26.64	30.10	100.00
	col%	.53	.75	.49	.55	-
	grams	14.13	22.40	22.49	25.42	84.44
sugars and non-alcoholic beverages	row%	19.98	29.80	27.13	23.09	100.00
	col%	20.97	28.23	16.57	14.15	-
	grams	562.48	839.22	763.93	650.31	2815.94
total	row%	18.05	20.00	31.02	30.93	100.00
	col%	100.00	100.00	100.00	100.00	-
	grams	2683.04	2972.68	4609.97	4596.47	14892.16

[a]low MAR, low income group
[b]low MAR, high low income group (negative deviants)
[c]high MAR, low income group (positive deviants)
[d]high MAR, high low income group

(about 4600 grams) then the lower MAR groups (about 2900 grams).

Caster (24) found that low income individuals who had poor dietary intakes in his 1975 survey, consumed milk, coffee (or tea), soft drinks, citrus fruit and juices, and cereals and bread (including corn grits, corn bread and biscuits) most frequently. Their food consumption pattern was similar to that of the two low MAR groups (group 1 and 2) in the present study, who consumed milk and milk products, meat, breads and cereals, fruit and vegetables, and sugar and non alcoholic beverages as the largest percent of their diet (Table 8). The only difference between the low MAR groups (group 1 and 2) and the high MAR groups (group 3 and 4) was in the consumption of sugar and non alcoholic beverages. The low MAR groups consumed a larger percent of this food group than the high MAR groups.

Stepwise Discriminate Analysis

The stepwise discriminate analysis selected 11 variables that were useful in discriminating between the four MAR-income groups: milk; bread; quick bread, cakes, cookies, pies and pastry; citrus fruit and juices; other fruit; dark green vegetables; white potatoes; other vegetables; age; food stamps and shopper of food (Table 9 and 10). These variables were selected as most important, because they met the .001 significant level (which was choosen due to the large sample size) in several of the stepwise discriminate analysis. Stepwise 1 in Table 9 entered all the variables from milk to age as independent variables and resulted in seven variables meeting the partial R^2 level of .02. The partial R^2 of a variable determines the level of importance that variable has in classifying an individual into one of the 4 MAR-income groups. If these same variables were also significant in several other

analysis they were deemed to be important discriminant variables.

The use of food stamps proved to be the most important factor, because it was chosen as the number one variable in all the stepwise discriminate analyses in which it was entered. In the positive deviant group 68% were using food stamps and most (86%) had been receiving them for 10-12 months. Only 20% of the negative deviant group was receiving food stamps and they had been receiving them for a shorter period of time. Schuck and Taratt (26) in 1969 stated that food stamps had little effect in their survey population. This was because only a small percent of that survey population participated in the Food Stamp Program.

The milk group was the second most important variable. This is shown in the different consumption rates of the MAR-income groups. The positive deviants consumed a mean amount of 1145.36 grams while the negative group consumed a mean amount of 426.76 grams (Table 5). In several other surveys (24, 23 and 29) the subjects also consumed milk in large amounts.

The next four variables that had about the same importance in discriminationg between the MAR-income group were: other vegetables, dark green vegetables, breads, and quick breads, cakes, cookies, pies and pastry. All of these food groups were consumed in larger amounts by the positive deviants thAn the negative deviants.

The last five variables, white potatoes, citrus fruit and juices, other fruit, age and usual person who shop for food, were also important in determining difference in the 4 MAR-income groups. The food groups were consumed in larger amounts by the positive deviants. The shopper

Table 9 Summary of the stepwise selection process, using partial R^2, and different combinations of independent variables[a]

variable name	Stepwise1[b,g,h] partial R^2	Stepwise2[c,g,h] partial R^2	Stepwise3[d,g,h] partial R^2	Stepwise4[e,g] partial R^2
milk	(1)[f].1682*	(2).1690*		(2).1832*
milk desserts	-	-		(4).1101*
cheese	-	-		-
beef	-	-		-
pork, lamb, veal	-	-		-
poultry	-	-		(27).0379****
variety meats	-	-		(5).0922*
fish and shellfish	-	-		(21).0463****
meat mixture	-	-		(37).0344****
eggs	-	-		(15).0652***
legumes	-	-		(9).0706**
nuts, nut butters carob, seeds	-	-		-
flour	-	-		-
breads	(4).0484*	(4).0508*		(17).0825**
quick breads, cakes cookies,pies,pastry	(5).0384*	(3).0612*		(34).0266****
crackers and snacks from grain	-	-		(38).0195****
cooked pasta & cereal	-	-		(32).0274****
ready-to-eat-cereal	-	-		(31).0396****
grain mixture	-	-		(10).0692**
citrus fruit & juice	(7).0194*	(7).0247*		(12).0714**
other fruit	(6).0283*	(10).0178*		(23).0467****
white potatoes	-	(8).0228*		(22).0431****
dark green vegetable	(2).0601*	(5).0439*		-
deep yellow vegetables	-	-		(30).0318****
tomatoes	-	-		(36).0243****
other vegetables	(3).0523*	(6).0346*		(3).1498*
vegetable mixtures	-	-		-
table fat	-	-		-
cooking fat and oil	-	-		(20).0479***
salad dressing	-	-		-
sugar	-	-		(16).0712**
sugar products	-	-		(26).0366****
coffee and tea	-	-		-
other non-alcoholic	-	-		(28).0446****
alcoholic beverages	-	-		(24).0399****
non-food misc.	-	-		-

Table 9 Summary of the stepwise selection process, using partial R^2, and different combinations of independent variables[a]

variable name	Stepwise1[b,g,h] partial R^2	Stepwise2[c,g,h] partial R^2	Stepwise3[d,g,h] partial R^2	Stepwise4[e,g] partial R^2
age	-	(9).0217*	(8).0474****	(18).0709***
food stamps		(1).1717*	(1).3350*	(1).3318*
sex		-	(3).0831**	(33).0279****
grow food			(11).0323****	(25).0352****
raise animals			(4).0873**	(35).0285****
freeze food			(15).0218****	-
can food			(5).0856**	(29).0389****
farm			-	-
family size			(13).0285****	(8).0835**
time in dwelling			(14).0535***	(13).0724**
female education			-	-
race			(9).0400****	(7).0843**
shopper of food			(2).0926*	(6).0888**
shopping frequency			(10).0354****	-
kind of store			(6).0663***	-
tenancy			(7).0170***	(11).0766**
preparer of food			(16).0180****	(14).0904**
WIC			-	-
school lunch			(12).0321****	(19).0569***

[a]entry level of .01 partial R^2 and a staying level of .02 partial R^2
[b]independent variables: all 36 food groups and age
[c]independent variables: all 36 food groups, age, food stamps, and sex
[d]independent variables: all socio-economic variables
[e]independent variables: all variables listed
[f]number in stepwise selection process
[g]dash indicates variable did not meet the staying partial R^2 level (.02)
[h]blank indicates variable not included in analysis
*$\leq$ .0001 **p$\leq$ .001 ***p$\leq$ .01 ****p > .01

Table 10 Summary of the stepwise selection process, using significant level, and different combinations of independent variables[a]

variable name	Stepwise1[b,g,h] partial R^2	Stepwise2[c,g,h] partial R^2	Stepwise3[d,g,h] partial R^2	Stepwise4[e,g] partial R^2
milk	(1)[f].1682*	(2).1690*		(2).1832*
milk desserts	-	-		(4).1101*
cheese	-	-		-
beef	(12).0151**	(11).0176**		-
pork,lamb,veal	(13).0143**	(14).0133**		-
poultry	-	-		-
variety meats	-	-		(5).0922*
fish and shellfish	(14).0137**	(13).0138**		-
meat mixture	-	-		-
eggs	-	-		-
legumes	-	-		(9).0706***
nuts, nut butters carob, seeds	-	-		-
flour	-	-		-
breads	(4).0484*	(4).0508*		-
quick breads,cakes cookies,pies,pastry	(5).0384*	(3).0612*		-
crackers and snacks from grain	-	-		-
cooked pasta,cereal	(10).0168*	(16).0118***		-
ready-to-eat-cereal	(11).0168*	(12).0160*		-
grain mixture	-	-		-
citrus fruit & juice	(7).0194*	(7).0247*		-
other fruit	(6).0283*	(10).0178*		-
white potatoes	(8).0228*	(8).0228*		-
dark green vegetable	(2).0601*	(5).0439*		-
deep yellow vegetables	-	-		-
tomatoes	-	-		-
other vegetables	(3).0523*	(6).0346*		(3).1498*
vegetable mixtures	-	-		-
table fat	-	-		-
cooking fat and oil	-	-		-
salad dressing	-	-		-
sugar	-	-		-
sugar products	-	-		-
coffee and tea	-	-		-
other non-alcoholic beverages	-	-		-
alcoholic beverages	(15).0111***	-		-
non-food misc.	-	-		-

Table 10 Summary of the stepwise selection process, using significant level, and different combinations of independent variables[a]

variable name	Stepwise1[b,g,h] partial R^2	Stepwise2[c,g,h] partial R^2	Stepwise3[d,g,h] partial R^2	Stepwise4[e,g] partial R^2
age	(9).0195*	(9).0217*	-	-
food stamps		(1).1717*	(1).3350*	(1).3318*
sex		(15).0128***	(3).0831**	-
grow food			-	-
raise animals			-	-
freeze food			-	-
can food			-	-
farm			-	-
family size			-	(8).0835**
time in dwelling			-	-
female education			-	-
race			-	(7).0843**
shopper of food			(2).0926*	(6).0888**
shopping frequency			-	-
kind of store			-	-
tenancy			-	-
preparer of food			-	-
WIC			-	-
school lunch			-	-

[a]entry level of .01 and a staying level of .001
[b]independent variables: all 36 food groups and age
[c]independent variables: all 36 food groups, age, food stamps, and sex
[d]independent variables: all socio-economic variables
[e]independent variables: all variables listed
[f]number in stepwise selection process
[g]dash indicates variable did not meet the staying significant level (.001)
[h]blank indicates variable not included in analysis
*$p \leq .0001$ **$p \leq .001$ ***$p \leq .01$

of food was the female in 78% of the positive deviant group and a smaller percentage (63%) in the negative deviant group. Bruhn and Pangborn (26) also found that females were the usual shopper of food for the household.

Discriminate Analysis

A discriminate analysis gave some indication of how well the variables selected in the stepwise discriminate analysis were able to distinguish between the four MAR-income groups. The results from the analysis using 11 variables (milk; bread; quick bread, cakes, cookies, pies and pastry; citrus fruit and juices; other fruit; dark green vegetables; other vegetables; age; food stamps and shopper of food), are listed in Table 11. This analysis showed showed how well these variables were able to

place individuals in their the correct MAR-income group. Group 1 consiated

of 349 individuals, however only 208 (59.60%) were correctly

classified into group 1, while 103 group 1 individuals (29.51%) were incorrectly classified into group 2, 31 (8.88%) were incorrectly classified into group 3 and 7 (2.01%) were incorrectly classified into group 4. The above variables were most useful for correctly placing individuals into the negative deviant group (74.29%). These same variables correctly placed individuals into the high MAR, high low income group 65.24% of the time and into the low MAR, low low income group 59.60% of the time. Individuals were correctly placed into the positive deviant group 50.82 % of the time. The results mean that using these variables to classify the 1356 individuals into four MAR-income

group, were not very useful. This is because in most cases 35% to 50% of the individuals were not be classified into the correct MAR-income group.

When the individuals were divided into only two groups, high MAR and low MAR, excluding income, the 11 variables proved to be better predictors of the MAR group (Table 12). Individuals were correctly placed into the low MAR groups 89.11 and 90.48 percent of the time, and into the high MAR groups 74.15 and 80.48 percent of the time. This implies that income did not make a significant difference in the dietary adequacy of the individuals.

Table 11 Discriminate analysis using milk; bread; quick bread, cakes, cookies, pies and pastry; citrus fruit and juice; other fruit; dark green vegetables; white potatoes; other vegetables; age; food stamps and shopper of food; to correctly classify individuals into one of the four MAR-income groups

from group		number of observations and percents classified into group				
		1[a]	2[b]	3[c]	4[d]	total
1[a]	N	208	103	31	7	349
	%	59.60	29.51	8.88	2.01	100.00
2[b]	N	17	78	1	9	105
	%	16.19	74.29	0.95	8.57	100.00
3[c]	N	102	72	342	157	673
	%	15.16	10.70	50.82	23.33	100.00
4[d]	N	5	36	32	137	210
	%	2.38	17.14	15.24	65.24	100.00
total	N	332	289	406	310	1337[e]
	%	24.83	21.62	30.37	23.19	100.00

[a]low MAR, low low income group
[b]low MAR, high low income group (negative deviants)
[c]high MAR, low low income group (positive deviants)
[d]high MAR, high low income group
[e]19 observations missing due to deletion of infant foods and to no answer on the food stamp question

Table 12 Discriminate analysis using milk; bread; quick bread, cakes, cookies, pies and pastry; citrus fruit and juice; other fruit; dark green vegetables; white potatoes; other vegetables; age; food stamps and shopper of food; to correctly classify individuals into one of the two MAR groups

from group		number of observations and percents classified into group 1[a]	2[b]	total
1[c]	N	311	38	349
	%	89.11	10.89	100.00
2[d]	N	95	10	105
	%	90.48	9.52	100.00
3[e]	N	174	499	673
	%	25.86	74.15	100.00
4[f]	N	41	169	210
	%	19.52	80.48	100.00
total	N	621	716	1337[g]
	%	46.44	53.55	100.00

[a]low MAR
[b]high MAR
[c]low MAR, low low income group
[d]low MAR, high low income group (negative deviants)
[e]high MAR, low low income group (positive deviants)
[f]high MAR, high low income group
[g]19 observations missing due to deletion of infant foods and to no answer on the food stamp question

CONCLUSIONS

The major finding was that income was not related to the dietary adequacy of individuals. Low low-income individuals consumed diets that were more nutritionally adequate, than some high low-income individuals. Individuals who had less money but used food stamps frequently, had dietary intakes that were more nutritionally adequate, than those who did not use food stamps. For all foods, except coffee and tea, the positive deviants consumed the same or more of all food groups than the negative deviants. This was also true of the high MAR, high low-income group who consumed more than either of the two low MAR groups.

Finding a specific indigenous food consumption pattern was difficult because those individuals with a high MAR score consumed more of most food groups regardless of the food type. However several food groups, such as cheese; poultry; fish and shellfish; flour; crackers and grain snacks; vegetable mixtures; table fat; cooking fat and oil; salad dressing; sugar products; other non-alcoholic beverages; alcoholic beverages and non-food miscellaneous, were consumed in the same amount by each MAR-income group. The only food group consumed in greater quantity by the low MAR groups was coffee and tea. The purpose of this research was to help nutritionist identify factors associated with inadequate diets of low income families. These factors could then be used to help individuals or families improve their dietary intake. The indentification of socio-economic and dietary factors that are the most important constraints against a proper diet was undertaken in this research in order to inform nutritionist of the problems facing low income families. These findings indicate that nutritionists working

with low income families may want to be more selective in deciding on whom to spend their resources. Since income is not an important factor, nutritionist may want to use other criteria in determining who should receive help. A questionnaire involving the frequency and quantity of food consumed by an individual may be helpful. If the individual is consuming low amounts of foods consumed in greater quantity by the positive deviants in this study they are likely to need the assistance of a nutritionist. Or if the individual is consuming large amounts of coffee and tea, they may not be consuming enough other foods. Another area to look at is the use of food stamps. If the individual is not using food stamps, they also may need assistance. These individuals should be encouraged to use the food stamp program, since this may allow some of their other resources to be used for other household needs. The final conclusion is that income alone does not determine the nutritional quality of an individual's diet, and should not be used alone as the bases for including an individual into a nutrition or food aid program.

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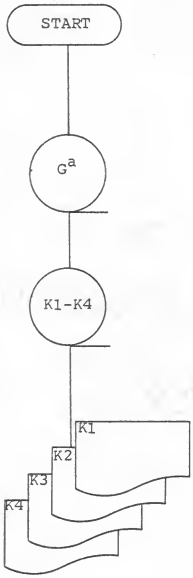
APPENDIX A

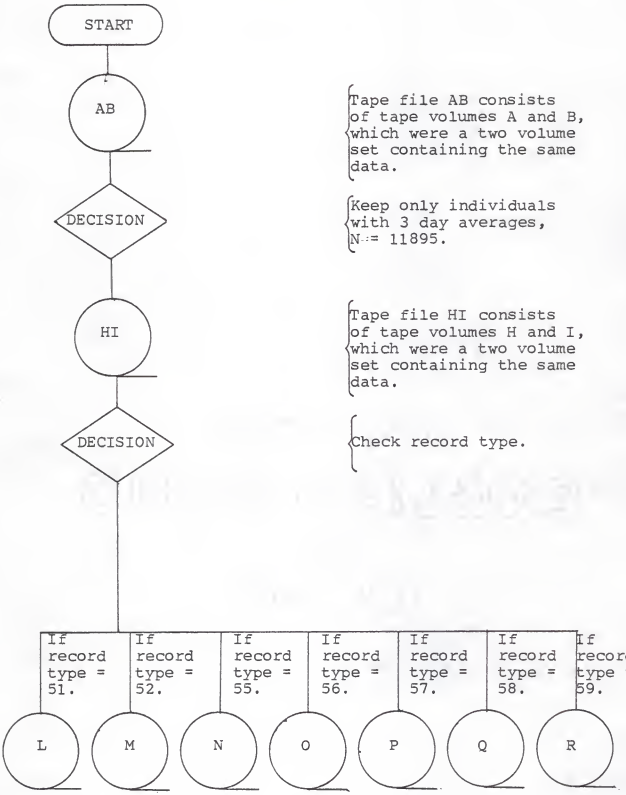
Creation of Final Working Tape File

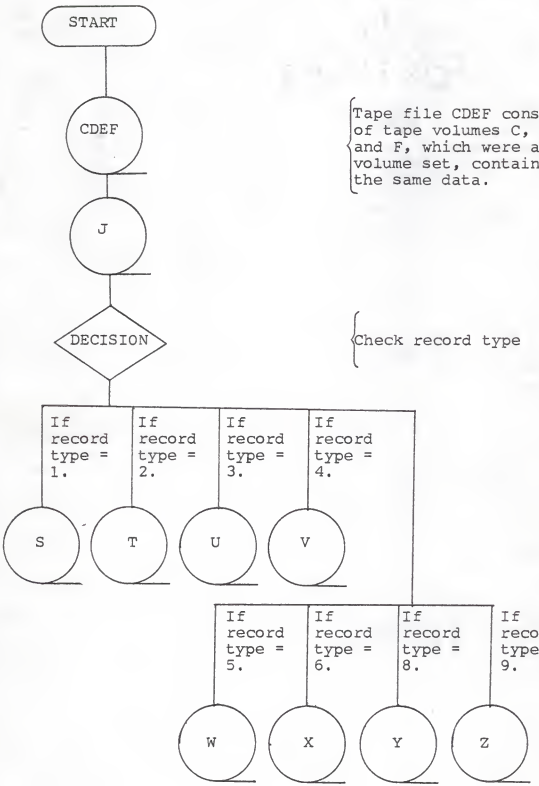


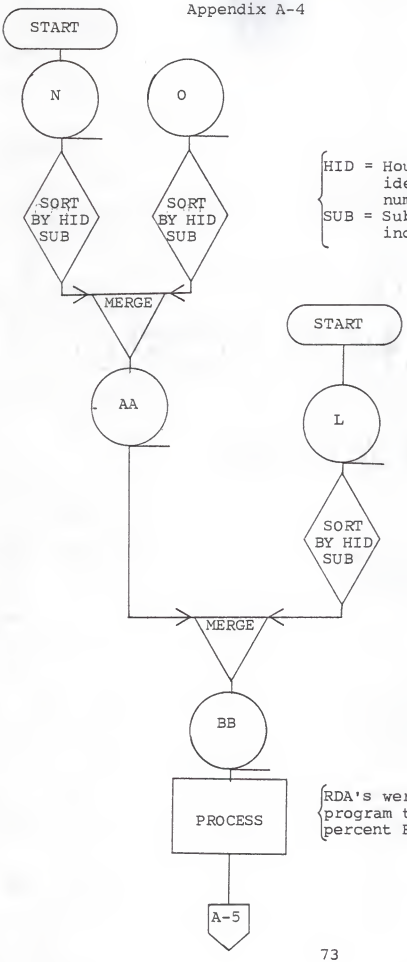
Tape file K1-K4 consists of tape file K1, K2, K3 and K4.

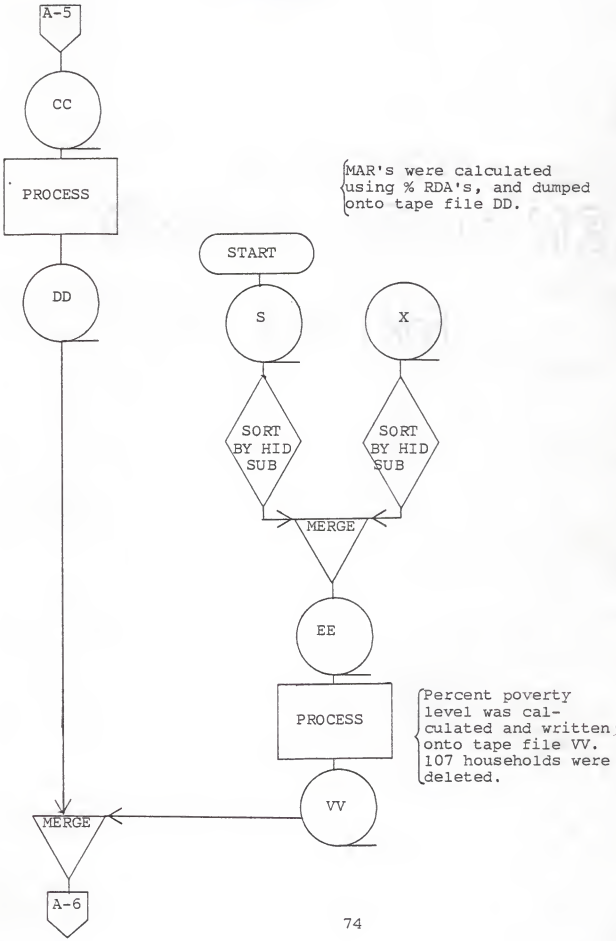
K1-Household Format
K2-Household Manual
K3-Individual Format
K4-Individual Manual

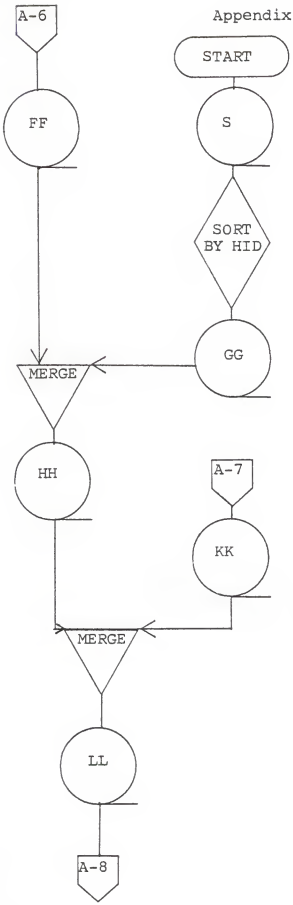
[a]Tape files in Appendix A are defined in Appendix C


START
AB
Tape file AB consists of tape volumes A and B, which were a two volume set containing the same data.
DECISION
Keep only individuals with 3 day averages, N = 11895.
HI
Tape file HI consists of tape volumes H and I, which were a two volume set containing the same data.
DECISION
Check record type.
If record type = 51.
If record type = 52.
If record type = 55.
If record type = 56.
If record type = 57.
If record type = 58.
If record type = 59.
L
M
N
O
P
Q
R


START
CDEF
Tape file CDEF consisted of tape volumes C, D, E and F, which were a four volume set, containing the same data.
J
DECISION
Check record type
If record type = 1.
If record type = 2.
If record type = 3.
If record type = 4.
S
T
U
V
If record type = 5.
If record type = 6.
If record type = 8.
If record type = 9.
W
X
Y
Z

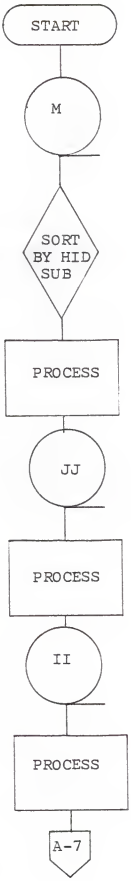

START
N
O
SORT BY HID SUB
SORT BY HID SUB
MERGE
AA
START
L
SORT BY HID SUB
MERGE
BB
PROCESS
A-5
HID = Household identification number
SUB = Subject number of individual
RDA's were added to the program to determine percent RDA's.


A-5
CC
PROCESS
MAR's were calculated using % RDA's, and dumped onto tape file DD.
DD
START
S
X
SORT BY HID SUB
SORT BY HID SUB
MERGE
EE
PROCESS
Percent poverty level was calculated and written onto tape file VV. 107 households were deleted.
VV
MERGE
A-6



Tape file FF had a record count of 11511. This is because of the 107 households that were deleted.

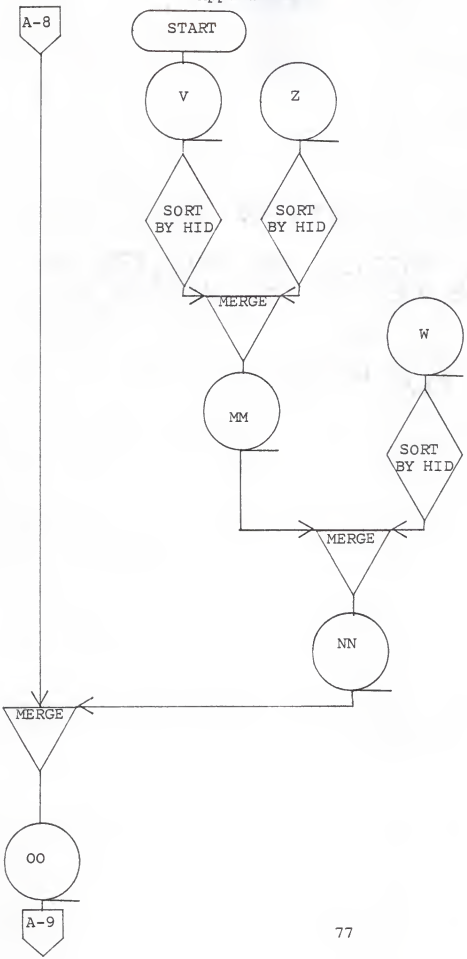
Tape File LL has a record count of 11425. This is because of the 86 individuals who only ate baby foods.



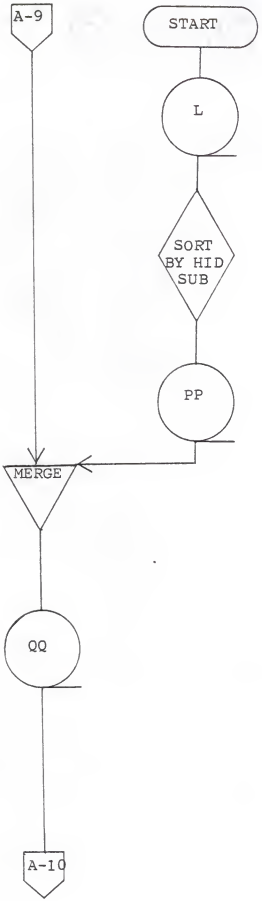
Classify foods into 38 food groups. Delete all baby food.

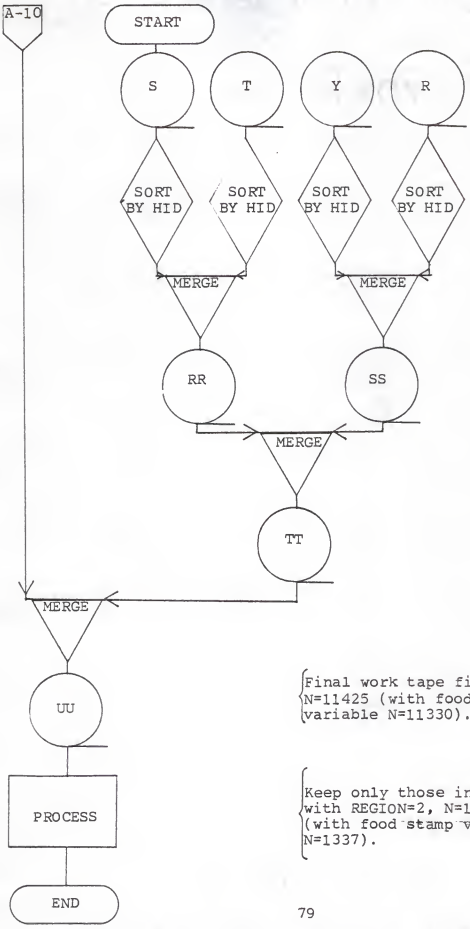
Recode food group variables

Recode food group variables


A-8
START
V
Z
SORT BY HID
SORT BY HID
MERGE
W
MM
SORT BY HID
MERGE
NN
MERGE
OO
A-9

Appendix A-9




A-10
START
S
T
Y
R
SORT BY HID
SORT BY HID
SORT BY HID
SORT BY HID
MERGE
MERGE
RR
SS
MERGE
TT
MERGE
UU
Final work tape file, N=11425 (with food stamp variable N=11330).
PROCESS
Keep only those individuals with REGION=2, N=1346, (with food stamp variable N=1337).
END

APPENDIX B

Variable List

Appendix B-1

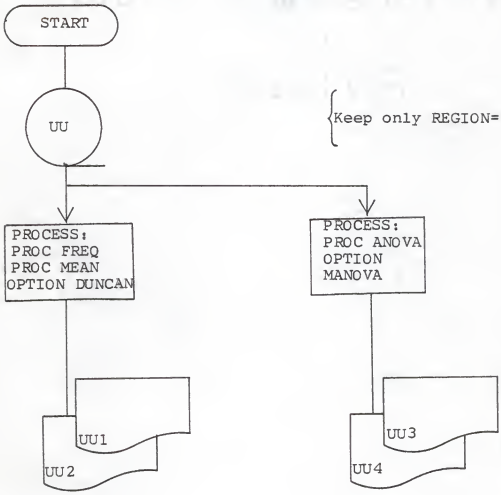
Variable List

1. record type
2. identification number
3. sex
4. age
5. weight
6. 3 day average
7. income
8. family size
9. use of food stamps
10. growing own fruit and vegetables
11. raising own animals
12. freezing own food
13. canning own food
14. living on a farm
15. education of female head of household
16. race
17. shopping frequency
18. region
19. kind of store
20. length of time in dwelling
21. tenancy
22. usual food preparer
23. usual food shopper
24. benefits from WIC
25. participation in school lunch program
26. participation in school breakfast program

APPENDIX C

Data Analysis

Appendix C-1

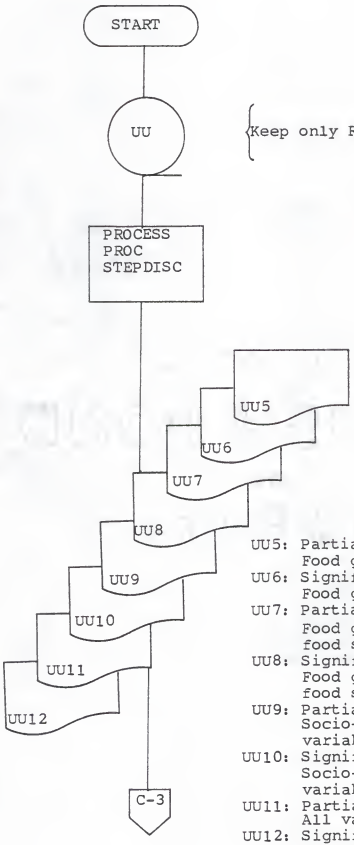


UU1: contains frequencies of socio-economic variables.

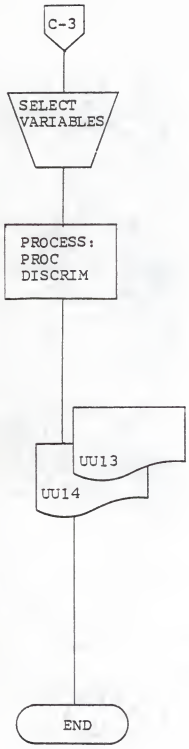
UU2: contains means of food groups for MAR-income and MAR-income, sex groups.

UU3: contains analysis of varience for MAR-income groups.

UU4: contains analysis of varience for MAR-income, sex groups.


START
UU
Keep only REGION=2.
PROCESS
PROC
STEPDISC
UU5
UU6
UU7
UU8
UU9
UU10
UU11
UU12
C-3
UU5: Partial R^2
Food groups and age
UU6: Significant level
Food groups and age
UU7: Partial R^2
Food groups, age, sex
food stamps
UU8: Significant level
Food groups, age, sex
food stamps
UU9: Partial R^2
Socio-economic
variables
UU10: Significant level
Socio-economic
variables
UU11: Partial R^2
All variables
UU12: Significant level
All variables

Appendix C-3



Select the variables shown to be important in the discriminate process.

UU13: All important variables; MAR-income groups.
UU14: All important Socio-economic variables; MAR-income groups.

APPENDIX D

Definitions of Tape Files

Appendix D-1

Master Tape Files[a]

Tape file	Tape file number
A	UR0172
B	UR0186
C	CN101
D	CN114
E	CN461
F	CN462
G	CN543

Intermediate Tape Files

Tape file	Number	Label	LRecl	Blksize	DSNname
H	9T25AD	1	120	9600	LOWINC.ONE.INDIV
I	9T26AD	1	120	9600	LOWINC.ONE.INDIV
J	9T27AD	1	120	4800	LOWINC.ONE.HOUSE
K1	9T32AD	1	120	4800	HOUSE.FORMAT
K2	9T32AD	2	120	4800	INDIV.FORMAT
K3	9T32AD	3	133	3990	HOUSE.MANUAL
K4	9T32AD	4	120	4800	INDIV.MANUAL
L	9U27AD	1	36	3600	LOWINC.INDIV51
M	9U28AD	2	32	3200	LOWINC.INDIV52
N	9U28AD	1	79	7900	LOWINC.INDIV55
O	9U29AD	1	75	7500	LOWINC.INDIV56
P	9U30AD	1	12	2400	LOWINC.INDIV57
Q	9U31AD	1	33	3300	LOWINC.INDIV58
R	9U31AD	2	39	3900	LOWINC.INDIV59
S	9U27AD	2	46	4600	HOUSE.TYPE01
T	9U27AD	3	17	3400	HOUSE.TYPE02
U	9U27AD	4	14	2800	HOUSE.TYPE03
V	9U27AD	5	9	1800	HOUSE.TYPE04
W	9U27AD	6	36	3600	HOUSE.TYPE05
X	9U27AD	7	72	7200	HOUSE.TYPE06
Y	9V56AD	1	27	2700	HOUSE.TYPE08
Z	9V56AD	2	11	2200	HOUSE.TYPE09

[a]Tape files received from the Consumer Nutrition Center

Appendix D-2

Intermediate SAS Tape Files

Tape file	Number	Label	DSNname	SAS Data set name
AA	9U56MS	1	SAS.IND5556	IND5556
BB	9U59MS	2	SAS.IND5156	IND5156
CC	9U60MS	1	SAS.INDRDAP	RDAP
DD	9U60MS	2	SAS.MAR2	MAR2
EE	9U56MS	3	SAS.HOUS0106	HOUS0106
FF	9U60MS	3	SAS.MARINC2	MARINC2
GG	9U30AD	2	SAS.REGION	REGION
HH	9U31AD	3	SAS.GROUPS	GROUPS
II	9U30AD	3	SAS.FDC2	FDC2
JJ	9U29AD	2	SAS.FDC1	FDC1
KK	9U31AD	4	SAS.FDC3	FDC3
LL	9U30AD	4	SAS.FDINDIV	FDINDIV
MM	9V56AD	3	SAS.HOUS0409	HOUS0409
NN	9V56AD	4	SAS.HOUS495	HOUS495
OO	9V56AD	5	SAS.FDIN495	FDIN495
PP	9V57AD	1	SAS.AGESEX	AGESEX
QQ	9V57AD	2	SAS.FDSEXAGE	FDSEXAGE
RR	9V58AD	1	SAS.HOUS0102	HOUS0102
SS	9V56AD	6	SAS.HOUS0859	HOUS0859
TT	9V58AD	2	SAS.MERGEALL	MERGEALL
UU	9V58AD	3	SAS.FDNEW	FDNEW

INDIGENOUS FOOD PATTERNS OF LOW INCOME INDIVIDUALS FROM NORTH CENTRAL UNITED STATES

by

JAMIE LYNN PRATHER

B. S., Kansas State University, 1982

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Foods and Nutrition

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1984

ABSTRACT

Three day dietary records of 1346 individuals from the low income subset of the 1977-78 Nationwide Food Consumption Survey (NFCS) were analyzed to determine how low income families with adequate diets differ from those with inadequate diets. Subjects were classified according to adequate or inadequate nutrient intake based on the Mean Adequacy Ratio (MAR) and income above or below the 1977-78 poverty level. The 38 food groups used in the intial NFCS analysis were used in this analysis. Multivariate statistical techniques were used to examine food patterns and socioeconomic characteristics. Adequacy of nutrient intake was more associated with amount of food consumed than with income. All 36 food groups mentioned in the study, except coffee and tea, were either consumed in larger or the same amounts by individuals who unexpectedly had adequate dietary intakes. Coffee and tea was consumed in larger amounts by individauls who unexpectedly had inadequate dietary intakes. Significantly more individuals with higher MAR scores used food stamps then those with lower MAR scores.