73-29,684

DESKINS, Barbara Brown, 1929-
SPATIAL VARIATION IN FOOD HABITS AMONG PUBLIC HIGH SCHOOL STUDENTS IN INGHAM AND JACKSON COUNTIES, MICHIGAN.

Michigan State University, Ph.D., 1973
Geography

SPATIAL VARIATION IN FOOD HABITS AMONG PUBLIC
HIGH SCHOOL STUDENTS IN INGHAM AND
JACKSON COUNTIES, MICHIGAN

By

Barbara Brown Deskins

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Geography

1973

ABSTRACT

SPATIAL VARIATION IN FOOD HABITS AMONG PUBLIC HIGH SCHOOL STUDENTS IN INGHAM AND JACKSON COUNTIES, MICHIGAN

By

Barbara Brown Deskins

Research studies dealing with the nutritional status of teenagers in the United States today have shown that many adolescents are less than adequately nourished. Although several factors which account in part for this poor nutritional status have been identified, much additional information is needed not only for a complete understanding of the problem but also for effective nutrition education programs. The present study was undertaken in an attempt to provide more insight into teenage food habits and nutritional status by using geographical techniques, thus applying methodology from both consumption geography and medical geography. An area was chosen to be studied which was believed to be typical of midwestern United States, and the hypothesis was put forth that significant spatial variation existed in the food habits of public high school students in Ingham and Jackson Counties, Michigan.

The sample population employed for this study included approximately 10% of the total 10th, 11th, and 12th grade populations of 14 public high schools in the geographical area selected, yielding a final sample size of 911 subjects. Teenagers from urban, rural, and suburban areas were included.

Information was collected from these students, by means of a questionnaire, on their actual food intake for 24 hours, other food habit characteristics, and certain socio-economic data. Subjects were identified by the census tract, and in urban Jackson, by the city block in which they lived for subsequent spatial analyses. A variety of statistical and other techniques were used for analyzing the data collected including census tract averages, histograms, simple correlations, factor analysis, and mapping.

The initial analysis was non-spatial and covered the food habit and nutritional characteristics for the entire survey population. Data were compiled which show the mean nutrient intakes by the teenagers in the study for a 24 hour period, as well as the average number of servings they consumed from a variety of food groups. Additional food habit variables presented cover the subject's meal and snack patterns, and attitudes towards a variety of foods, and family food purchasing and preparation patterns. Nutritional characteristics analyzed include the percentage of the Recommended Dietary Allowances that the subjects consumed of the various nutrients studied, whether or not they used a vitamin preparation, and the extent of their obesity, if any. Socio-economic and cultural variables derived from the study were correlated with the food habit and nutritional variables in order to offer some explanation as to why the teenagers ate the way they did.

The spatial analysis involved studying these same food habit and nutritional variables, but the subjects were grouped by census tracts and city blocks to identify areal patterns of differences and homogenity. Census tract averages were obtained for all the food habit, nutritional, and socio-economic factors derived from the study and many of these factors were mapped. Very definite spatial patterns emerged for some of the variables such as ascorbic acid intake, the consumption of fruits, and obesity thus indicating that there was considerable variation over space. The food habit and nutritional characteristics for the subjects were then correlated with selected factors obtained for the census tracts and city blocks from the 1960 United States Census Data for the enumeration areas in which they lived. These correlations showed relationships existing between many food intake and nutritional characteristics and census tract variables such as color, ethnic background, occupation, education and/or income of the residents of the tracts in which the subjects lived. Also related in many instances was the housing in both the census tracts and the city blocks in which the subjects resided.

ACKNOWLEDGEMENTS

The author wishes to express her gratitude to her major professor, Dr. John Hunter, for the immeasurable amount of guidance and help furnished by him. Also, she wishes to thank Professors Lawrence Sommers, Dena Cederquist, and James Wheeler for their encouragement and helpful comments. The contributions of Dr. Cecelia Florencio and Miss Robin Hirschert in interviewing students are also gratefully acknowledged.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

The nutritional status of the adolescent in the United States today is viewed by many knowledgeable people with concern. That the adolescent's food intake is often less than optimal in terms of current recommended allowances has been well documented in certain regions of the United States, although total knowledge of the situation is far from complete. Why this less than optimal nutrition exists, and just how serious the effects of it are, are two questions that rightly concern those involved in any aspect of nutritional research. Because these young people are our greatest potential resource, it seems vital to have them as nutritionally fit as possible. Nutrition education for both teenagers and their families is necessary to achieve this goal, but such nutritional programs need more research as a foundation into the whole question of current teenage food habits. Hence, additional information on adolescent food habits and the use of new methodology in examining these habits could be expected to provide assistance in terms of how to improve nutrition for this age group. The study presented here, then, was conceived and executed in an attempt to acquire more data on teenage food habits than now exists, and then to apply geographical techniques as a method of gaining more insight into the whole picture of adolescent nutrition, particularly in the midwestern United States.

Review of Literature

Before relating the current study to both the sciences of geography and nutrition, a review of the general characteristics of adolescent nutrition in the United States, and particularly in the Midwest is presented.

Nutritional Needs of the Adolescent

Nutrition should be of vital concern to all age groups within any given population. Human beings require about forty-one essential nutrients, which they acquire almost exclusively through food, for proper functioning and growth of the body. These nutrients can be grouped into classes: The vitamins, the minerals, the essential amino acids or protein, plus adequate sources of energy foods, carbohydrate and fat. Deprivation of any of these nutrients leads to less than optimal health and well-being, then to illness, and finally death if the nutrient is withheld for a sufficient period of time. Too large a quantity of at least certain of the nutrients is also known to be harmful.

Why then should the nutritional needs of the adolescent be viewed with particular concern? Everson makes the following statements:

> First, this is a period of accelerated growth, causing high nutritional requirements of certain factors . . . a decided increase in growth occurs during adolescence, with an accompanying need for improvement in the nutrient supply . . . Second, this is a period marked by inefficient use of certain important

> substances because of the frequency and magnitude of emotional problems often facing the teenager.[1]

Hodges and Krehl make the following statement about the problem of correct food for teenagers:

> In the United States the teenage population is most apt to manifest the effects of nutritional errors. Pediatricians have done so well in educating parents regarding the nutritional needs of infants and younger children that nutritional problems in these age groups are rare unless intercurrent illness or poverty exists. On the other hand, the teenage child is approaching that period in life when individual expression and frank social rebellion seem not only desirable but also essential to the development of a "mature personality." It is little wonder then that the teenager expresses his individuality not only in his dress, his choice of words, his selection of music and his coiffure, but also in the foods he eats and the time and places he eats them. The teenager is not willing to accept the admonition of his parents that he must eat certain foods or indeed that he must eat certain meals, but is inclined to invent individual eating patterns and to develop rather limited dietary habits. The school lunch program has done much to protect the teenager against frank malnutrition, but in some schools the student has the option of eating in the cafeteria, bringing his own lunch or going to a neighboring lunch counter.[2]

Thus, two conflicting sets of events are set into motion in the early teen years which often result in poor nutritional status: One if the rapid increase in the size of the adolescent called the growth spurt, while the other relates

---

[1]Gladys J. Everson, Bases for Concern about Teenagers' Diets, J. American Diet Assoc. 36:17, 1960.

[2]Robert E. Hodges and W. A. Krehl, Nutritional Status of Teenagers in Iowa. Amer. J. Clin. Nutr. 17:200, 1965.

to increased psychological stresses which often cause either a poor choice of food, or poor utilization of food that is ingested. Studies across the United States have shown that children under twelve years of age in general have adequate, even deluxe, nutrient intakes with the possible exception of calcium.[3] It is with the onset of adolescence that the nutritional picture often begins to deteriorate.

The Growth Spurt

In an attempt to provide a guide for nutrient intakes for the different age and sex segments of the population, the Food and Nutrition Board of the National Research Council established the Recommended Dietary Allowances.[4] These are quantitative statements of amounts of many of the essential nutrients, which are designed for the maintenance of good nutrition of practically all healthy people in the United States. There is a separate category for boys, ages 14 to 18, and for girls 14 to 16, and 16 to 18. These are the particular allowances dealt with in the present study. By examining the allowances for all segments of the population, it can easily be observed that the adolescents have very large quantitative allowances for the various nutrients. This, of course, is a reflection of the large increase in

---

[3]Agnes Fay Morgan (ed.) Nutritional Status, U.S.A., California Agricultural Experiment Station Bulletin 769, 1959, p. 5.

[4]National Academy of Sciences, Recommended Dietary Allowances, Seventh Revised Edition, Publication 1694, Washington, D.C. 1968.

physical size which these children will undergo during adolescence.

Using these allowances as a guide, then, a series of surveys has been conducted in various parts of the United States to determine the actual nutrient intake of groups of adolescents.

Nutritional Surveys - Undernutrition

One of the largest of the nutritional surveys to take place in the United States to date was the interregional survey on nutritional status done between 1947 and 1958. Many different kinds of surveys were done on various segments of the population. Adolescents from 13 to 16 years were studied in 8 Western and 3 Northeastern states. The results of the surveys are summarized in "Nutritional Status U.S.A."

> The intakes of adolescents 13 to 20 years old were more variable and less favorable, especially those of the girls, than were those of either the younger children or the adults. Of the 26 groups of boys and girls studied in as many states those 13 to 16 years old were examined in 8 Western and 3 Northeastern states. Over 90 per cent of the boys had intakes exceeding two-thirds of the recommended allowances for protein, except for the Spanish American group in New Mexico. More than a fifth of this group of boys and also of the Colorado and Maine boys had diets providing less than two thirds the recommended amounts of calcium, a third were equally low in thiamine, nearly a fifth were low also in niacin, and about half were this low in vitamin C. A much greater proportion of girls lacked these food nutrients to this extent. About 20 to 40 per cent of the girls had diets relatively low in protein, vitamin A, riboflavin, and niacin. More than 50 per cent had diets relatively low in calcium and ascorbic acid among the girls studies in New Mexico, Colorado and

> Montana. Relatively few of both boys and girls in Oregon, New York and Maine had low nutrient intakes. Only in calcium, vitamin A and vitamin C were there usually more than 10 per cent of the diets in these three states in the low-intake columns.[5]

Clearly the teenager, particularly the girl teenager, has a less than optimal diet, if the Recommended Dietary Allowances are used as a basis for comparison.

A more recent study in California, dealing with students in the ninth through twelfth grades, showed that the diets of many of the adolescents, especially the girls, were inadequate in calcium and iron, and to a lesser degree in ascorbic acid and vitamin A.[6] Leverton states that teen-ager's diets studied to date are most apt to fall short of the allowances in calcium, iron, and ascorbic acid.[7] Some researchers have tried to find out why this undernutrition exists, and a variety of reasons have been put forth. Hinton, et al. studied 140 girls between the ages of 12 to 14. One factor revealed by this research was that it was not unusual for these girls to miss at least one meal a day. These girls indicated they enjoyed the noon and evening meal more than breakfast. They were often not hungry at breakfast. Other meals were missed because of eating snacks before meals, or because they did not like the food served at

---

[5]Morgan, p. 7.

[6]Mary C. Hampton, et al. Caloric and Nutrient Intakes of Teen-agers. J. Amer. Diet. Assoc. 50:385, 1967.

[7]Ruth M. Leverton, "The Paradox of Teenage Nutrition," Paper read before the American Dietetic Association, Chicago, Illinois, August 14, 1967.

meals. Family criticism of not eating the right kind or amount of food, or eating too often or too slowly was found to be significantly and negatively related to choosing an adequate diet.[8]

A study by Spindler and Acker indicated that students 15-17 years old recognized that in their desire to be identified with the teen group, they selected foods their peers ate, even though they might be well aware that other foods would be more nutritious. The teenagers were weight-, complexion-, and personality-conscious. It was important to them to be the "right" size for boys, physically well-built for girls, slender, but not thin.[9] Research by Dwyer et. al. in the Boston area revealed similar physical goals.[10]

In a supplementary paper to the California Study mentioned previously, Huenemann et. al. make the following observations:

> Four weekly food diaries kept by 122 Junior and Senior high school students over a period of two years showed marked irregularity in eating practices by approximately one-third and great variation among subjects, associated to some extent with ethnic and socio-economic factors. Snacking was common

---

[8]Maxine A. Hinton, et. al. Eating Behavior and Dietary Intake of Girls 12 to 14 Years Old. J. Amer. Diet. Assoc. 43:223, 1963.

[9]Evelyn B. Spindler and Geraldine Acker, Teen-Agers Tell Us About Their Nutrition. J. Amer. Diet. Assoc. 43:228, 1963.

[10]Johanna T. Dwyer et. al. Adolescent Attitudes Toward Weight and Appearance. J. Nutr. Educ. 1:14, 1969.

and tended to benefit nutrient intakes. The meal most frequently skipped was lunch.[11]

Steele et. al. found in a study of seven-day dietary records for 181 adolescent girls and 135 adolescent boys, that boys and girls who always had breakfast more nearly met the recommended allowances for their age groups than those who missed breakfast once a week or more.[12]

Between 1968 and 1970, the Department of Health, Education and Welfare conducted a nutrition survey in ten states within the United States to determine the magnitude and location of malnutrition in this country. The study was particularly interested in obtaining information from the low-income segment of the population, and hence the findings cannot be considered representative for the entire country. However, the researchers did find that: "Among the various age groups surveyed, adolescents between the ages of 10 and 16 years had the highest prevalence of unsatisfactory nutritional status."[13]

Undernutrition, at least in terms of the Recommended Dietary Allowances, then is a problem for a great many

---

[11]Ruth L. Huenemann et. al. Food and Eating Practices of Teen-agers. J. Amer. Diet. Assoc. 53:17, 1968.

[12]Betty F. Steele et. al. Role of Breakfast and of Between-Meal Foods in Adolescents' Nutrient Intake. J. Amer. Diet. Assoc. 28:1054, 1952.

[13]U.S. Department of Health, Education, and Welfare, Highlights from the Ten-State Nutrition Survey 1968-70, Nutrition Today 7 (No. 4):4, 1972.

adolescents, and it seems to exist for a variety of reasons. Some of those studied so far include: missed meals and irregular eating practices, social and emotional maladjustment, desire to be like their peers, ethnic and socio-economic factors, and consciousness of appearance. Doubtless, many others exist as well.

The manifestations of this indicated undernutrition are very difficult to assess. There are few cases now in the United States of clear-cut deficiency diseases, where the nutrient is missing from the diet to such an extent as to show up in a definite clinical illness. One exception to this might well be anemia. Heald states that although the incidence of iron-deficiency anemia in adolescent girls is unknown, unpublished data suggest frequent mild cases. He attributes the cause of this anemia to a combination of the growth spurt and poor nutrition.[14]

In most instances, however, clinical signs of malnutrition are not evident, though at least one study to be mentioned in connection with midwestern adolescent nutrition, does report lesions of this type. Dr. Everson, however, puts forth this description of the possible differences between the well- and poorly-nourished adolescent: "We are impressed with the vast differences in appearance of teenagers, from

---

[14]Felix P. Heald, Iron-Deficiency Anemia in Adolescent Girls. Postgrad. Med. 27:104, 1960.

the boy or girl who has almost uncontrollable energy and who looks 'the picture of health' and the apathetic and listless child with little pep."[15]

Obesity

Perhaps of even greater concern than undernutrition of adolescents today in the United States is the problem of obesity. Garrell, in his article on adolescent medicine, states that obesity constituted a major clinical problem in a considerable number of adolescent clinics. Questionnaires were sent to adolescent medical clinics asking them to rank among other things the five most frequent organic diagnoses. Obesity was the most common organic diagnosis mentioned.[16] The Ten State Nutrition Survey mentioned previously also reported large numbers of obese adolescents.[17]

In its simplest form, obesity can be defined as the storage of excess calories as body fat to the point where the individual is overweight. Just how much overweight, or excess body fat, constitutes obesity is not always agreed upon, and a variety of techniques have been suggested to measure obesity. However, all researchers do agree that adolescent obesity, however defined, is a public health

---

[15]Everson, p. 17.

[16]Dale C. Garrell, Adolescent Medicine, Am. J. Diseases of Children 109:314, 1965.

[17]U.S. Department of Health, Education and Welfare, p. 8.

problem. Huenemann has indicated that from the scanty information available, 10-15% of the teenage population is obese.[18]

Adolescents are aware of obesity as a problem, though Dwyer et. al. found that girls who were dieting in the adolescent group he studied were doing so for reasons of appearance rather than health.[19] Huenemann offers further evidence of this type from her work with ninth through twelfth graders in Berkley, California:

> The popular impression that teen-agers were keenly interested in the size and shape of their developing bodies was well documented by the replies of this group. In the 9th grade, 50% of the boys and 65% of the girls said they were trying to gain or lose weight or to change their body proportions. As to the specific action undertaken, changes in diet outranked changes in physical activity. For each boy who mentioned exercise, one and one-half mentioned diet, for each girl who listed exercise, three specified diet. Fifty-seven percent of the boys, both in the 9th and 10th grades, wanted to gain weight. Forty-three percent of the girls in the 9th grade and 51% in the 10th grade wanted to lose weight, even though the prevalence of "mild" and "marked" obesity combined was only 11% and 12% in those grades, judged by our more objective standards. The obese appeared to recognize their obesity, for all but about 10% of the obese described themselves as "too fat."[20]

However, dieting itself--that is, the restriction of caloric intake--may not be an adequate solution, particularly

---

[18]Ruth L. Huenemann, Consideration of Adolescent Obesity as a Public Health Problem. U.S. Pub. Health Reports 83:491, 1968.

[19]Dwyer, p. 19.

[20]Ruth L. Hueneman et. al., Adolescent Food Practices Associated with Obesity. Fed. Proc. 25:4, 1966.

if this is the only approach applied. Often obese adolescents eat fewer calories than their non-obese peers. This was found to be true in a study by Johnson et. al. They did find, however, that the obese girls studied expended much less energy than did the non-obese ones.[21] Spargo et. al. reported similar findings at Camp Seascope, a summer camp for overweight girls.[22] In swimming, for example, the obese girls were only one-third as active as the non-obese girls at a nearby camp, and in volleyball they were two-thirds as active. Clearly then, caloric intake in relation to physical activity is important.

There are, however, other factors mentioned by researchers which appear important in the onset of adolescent obesity. These include genetic factors--certain body types tend toward obesity more than others--and psychological problems. While these fall outside of the realm of nutrition, the proper treatment of the nutritional problem of obesity can be accomplished only by considering all the factors involved. Thus, Hammar has suggested that an interdisciplinary approach to the problem is needed, and has described the cooperation that should exist between the nutritionist,

---

[21] M. L. Johnson et. al., Relative Importance of Inactivity and Overeating in the Energy Balance of Obese High School Girls. Am. J. Clin. Nutr. 4:37, 1957.

[22] John A. Spargo, et. al. Adolescent Obesity. Nutrition Today 1:2, 1966.

physician, nurse, and social worker in clinics working with adolescents.[23]

One additional point should be made here: the fact that obese adolescents indicate an excessive caloric intake in relation to their energy needs, does not mean that they are necessarily well-nourished in other respects. In the California Study, Hampton et al. found that mean intakes of minerals and vitamins tended to be less adequate in the obese than in those of normal weight or lean.[24]

Early Pregnancy

The number of pregnancies in the teenage years is increasing annually. The still-growing girl, with high nutritional demands made by her own body, must in addition supply nutrients to a growing fetus. Everson states that an "important medical problem associated with faulty diets of teenagers is the incidence of complication and the birth of stillborn infants among teenage mothers."[25] Claman and Bell, reporting on pregnancy in the very young teenager, felt that girls under sixteen had a tendency in many cases to develop acute toxemia because of improper diet, among other factors. They found the girls were reluctant to assume the responsibility of providing themselves with a proper diet.[26]

---

[23] S. L. Hammar, The Role of the Nutritionist in an Adolescent Clinic. Children 13:217, 1966.

[24] Hampton et al., p. 395. [25] Everson, p. 18.

[26] A. D. Claman and H. M. Bell, Pregnancy in the Very Young Teenager. Am. J. Obstet. Gynec. 90:350, 1964.

Nutritional Status of Adolescents in the Midwest

A few studies have been carried out which deal with adolescent nutritional status and food intake in midwestern United States. These studies were conducted in Illinois and Iowa and a brief one was done in Michigan.

Espright and Swanson examined the distribution of calories in the diets of 1,188 Iowa school children from 6-18 years of age in a state-wide study. There were some small differences in the percent distribution of calories among the various food groups at different ages, and the most conspicuous of these was a decrease by teenage girls in the percentage of calories from milk and cereals. Girls in the later teens with diets in the lowest nutritional category had more calories from sweet foods and desserts than those with totally adequate diets.[27]

A more recent state-wide, Iowa study was undertaken by Hodges and Krehl to evaluate teenage eating habits, and also to study the interrelationships between these habits and physical characteristics and biochemical values of a large number of factors. This survey involved a total of 2,045 high school students. The researchers found that although the average Iowa teenager is healthy and well-nourished, a significant minority of those students studied had physical

[27]E. S. Eppright and P.P. Swanson, Distribution of Calories in Diets of Iowa School Children. J. Amer. Diet. Assoc. 31:144, 1955.

lesions and biochemically abnormal test results. The dietary questionnaire indicated that a substantial minority of the students omitted breakfast and ate diets which could not be considered as well-balanced. The consumption of dairy products was high, as was that of sugar products such as candy and soft drinks.[28]

The point was made in the Hodges and Krehl study that Iowa was chosen because poverty did not exist to any great degree. A study in southern Illinois, however, was designed by Wharton to include poverty or depressed areas. Students from three high schools were involved: (1) a high school in a university town, (2) a high school in an industrial and coal mining town where a large percentage of the population was of southern European stock, and (3) a high school attended by blacks. An evaluation was made of the mean daily intakes of eleven nutrients from three-day dietary records. Calcium, iron, vitamin A, and ascorbic acid were again the nutrients consumed in the lowest amounts. Wharton reports

> The boys' diets were significantly higher than the girls' for protein, calcium, phosphorus, iron, and riboflavin. The girls consumed a greater proportion of the Recommended Dietary Allowances for calories, niacin, and ascorbic acid. The older adolescents had a higher intake of vitamin A. The nutritive intake of the Negro group was significantly better than for the whites for calories, iron, vitamin A, thiamine, and niacin. The Negroes consumed 35 to 38 per cent of their calories as fat and the white students, 40 to 48 per cent.

---

[28]Hodges and Krehl, p. 209.

> The girls ate more snacks than the boys. In the groups where snacks provided 20 per cent or more of the energy value of the dietary, intake tended to be more adequate in all nutrients except vitamin A and ascorbic acid.[29]

McElroy and Taylor studied tenth grade Michigan male high school students to get information on values which were important to these boys in making food choices. The values mentioned were as follows: health, money, sociability, enjoyment, independence and status. No attempt was made to assess the nutritional adequacy of their diet.[30]

Insofar as it has been assessed, then, teenage nutrition does appear to be a matter for concern in the Midwest, whether the group includes teenagers from poverty areas or not.

Geography and Nutrition

This study was conceived with the idea that more insight could be obtained into the area of adolescent nutrition by the application of geographical techniques. Therefore, a brief discussion concerning the relationship between the sciences of nutrition and geography would seem appropriate. Nutrition, as was pointed out earlier, is a science dealing with the utilization of ingested food by the body. The particular problems of adolescent nutrition were identified

---

[29] Marion A. Wharton, Nutritive Intake of Adolescents. J. Amer. Diet. Assoc. 42:306, 1963.

[30] J. McElroy and B. Taylor, Adolescents' Values in Selection of Food. J. Home Ec. 58:651, 1966.

in the previous section. Geography, on the other hand, is a science which examines and analyzes variables over space. A combination of the two could give a new dimension to the entire picture of nutrition, in this case, teenage nutrition in the Midwest.

Two main areas of geography are involved in the present study: consumption geography and medical geography.

Consumption Geography

Geographers, when they have been concerned with food supplies of a population, have put their emphasis on the spatial variation of the production of food crops. However, J. E. Spencer states that "what may be called 'primary consumption' is fully as significant geographically as 'primary production' though professional geographers have paid scant attention to the subject and have concentrated on production patterns."[31] This study, however, presented the opportunity to study the food consumption patterns over space of one segment of the population in midwestern United States. Intakes of various food groups were calculated and mapped to show any spatial variation that existed in the consumption of dairy products, for example, or cereal foods. Therefore, primary consumption patterns for teenagers are analyzed spatially.

---

[31] J. E. Spencer, in a review of Eat Not This Flesh by F. Simoons, Geo. Rev. 52:630, 1962.

Medical Geography

The relationship of food habits to their physiological outcome-nutritional status-is encompassed by the area of medical geography, which has as its concern, spatial variation in health and disease. The nutritional well-being of populations is dependent not only upon their being supplied with adequate quantities of the essential nutrients, but also upon their ability to utilize these nutrients. Thus, factors which influence either the acquisition or the utilization of essential nutrients by people will in turn influence their nutritional status. There has been an increasing amount of evidence accumulating to indicate that food habits, or food consumption patterns, are an integral part of an individuals' complex social structure. As the Committee on Food Habits emphasized, people, in choosing what portion of the food supply they will eat, respond to a variety of social, cultural, and economic stimuli.[32] Several examples of this in terms of adolescent groups have already been mentioned. It should be pointed out here, however, that spatial variation in any factor which influences food habits will in turn result in spatial variation in nutritional status. Therefore, any areal patterns which emerge in terms of nutrient intake, would fall into the realm of medical geography, and these would become even more meaningful if they could be explained, at least in part, by social, cultural, and economic factors.

---

[32] National Academy of Sciences, Manual for the Study of Food Habits, National Research Council Bulletin 111, Washington, D.C., 1945, p. 23.

Hypothesis

A geographical analysis of teenage nutrition in the Midwest required the collection of certain types of data and the subsequent analysis of this data in a spatial context. The following hypothesis was the basis for the entire study: Significant spatial variation exists in the food habits of public high school students in Ingham and Jackson Counties, Michigan. The reasons for selecting public high school students as the teenage population, and Ingham and Jackson Counties as the specific geographical area representative of the Midwest are discussed in the chapter on methodology.

In order to investigate this hypothesis and to establish an areal picture of adolescent nutrition, several corollaries to the above hypothesis were developed, as follows:

1. The problems of adolescent nutrition are not spread equally over space, but rather exist in pockets. In other words, regions of good and poor teenage nutrition can be established.

2. Those nutrients that are deficient from the diet of teenagers can be identified and the spatial distribution of this deficiency can be mapped.

3. Obesity exists as a teenage problem and varies in amounts over space.

4. Spatial variation in teenage nutritional problems can be explained in part by identifiable social, cultural, and economic factors.

5. The family, the home, and the school play a significant role in the nutritional status of teenagers.

Research Objectives

The research objectives which were carried out in support of the above hypothesis are:

1. To determine and map regional variation in food habits among public high school students in Ingham and Jackson Counties, Michigan.

2. To identify any spatial variation in nutritional status that exists, insofar as this can be determined, within the limits of the study.

3. To identify, insofar as possible, those social, cultural and economic factors which interact to produce variation found in food habits and nutritional status.

4. To draw conclusions concerning the amount and type of spatial variation that exists in the food habits of Ingham and Jackson county public high school students.

Food Habits

As the specific nutrients come from the foods eaten by the teenager, the basic inquiry, of course, must be into the food habits of this particular group. Therefore, a definition of the term, food habit, would seem appropriate.

The Committee on Food Habits of the National Academy of Sciences has defined the unit of study, food habits as follows:

> The unit of behavior for a study of food habits is not the food, expressed in terms of international units or specific nutrients, nor the human being exercising will power in making proper or improper choices, nor the amount of wages available per family per month. It is a given human being (whose whole behavior

> has been modified by his social experience) consuming a given item of food (the constitution of which has often been modified by human means) at a given place (where the availability and quality of the food will have been determined partly by local geographical conditions and partly by man-made improvements that will include the import of materials such as fertilizer or new types of seed, or the import of foodstuffs from another locality) at a given period in history (with the climatic and social conditions characteristic of that period).
>
> If this unit be accepted as the suitable basis for research in the field of food habits, it follows that no statement is complete which does not include: identification of the food eaten so that it is possible to state that food in terms of nutrients; identification of the human being eating the food so that it is possible to define him further in terms of the entire body of cultural practices which he now embodies in his behavior; identification of the place from which the food comes or, put another way, the position of the human being in a food production and distribution system; the exact time at which the act under analysis is taking place.[33]

Thus it can be seen that examining the food habits of teen-agers involved gathering a wide variety of data related to the subjects' entire food consumption behavior. How this was carried out is described in Chapter 2.

Description of Geographical Area

The original sample area selected to test the hypothesis that spatial variation does exist in the food habits of teen-agers was Ingham County, Michigan. It was thought that it would be ideally suited for such a study in that it contained a large urban area, Lansing, complete with many of the inner

---

[33] Ibid., p. 25-26.

city problems which exist in United States cities today, and in addition it contained suburban and rural areas representing a variety of socio-economic groups. All public high school students in Ingham County attend one of 14 public high schools, and this had the attraction of making data collection relatively simple. However, the Lansing School Board refused to cooperate with the researcher in any way, and thus the students in the city of Lansing proper had to be excluded from the study. The Waverly School District, just to the west of Lansing, did cooperate fully, thus insuring a good sample of students from homes where family members were employed in blue-collar jobs at the automobile plants in the area. All other school boards in Ingham County allowed their students to be interviewed, although other problems arose which will be mentioned later.

The next problem, then, was to find an urban area which was somewhat similar to Lansing in that it contained a variety of socio-economic groups as well as a number of blacks, as Ingham County outside of Lansing contains very few black families. The city of Jackson, 37 miles south of Lansing, was finally chosen, and the Jackson School Board was most cooperative about arranging for interviews to take place in both of the Jackson public high schools. In order to make the study spatially more complete, students in the high school north of Jackson were also interviewed. Figure 1 indicates the location of the high schools and political units. It should also be mentioned that the

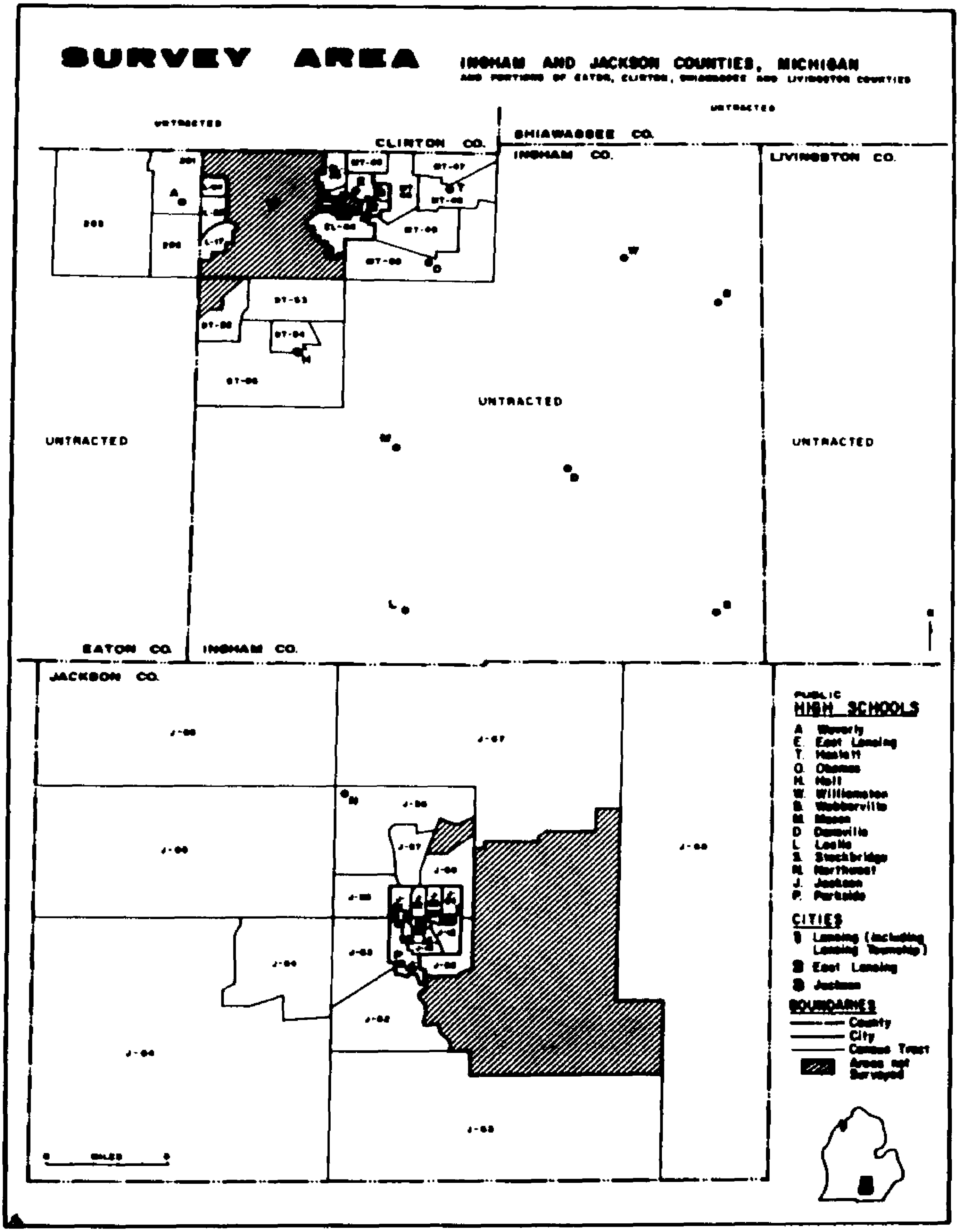
SURVEY AREA
INGHAM AND JACKSON COUNTIES, MICHIGAN
UNTRACTED
CLINTON CO.
SHIAWASSEE CO.
INGHAM CO.
LIVINGSTON CO.
UNTRACTED
UNTRACTED
UNTRACTED
EATON CO.
INGHAM CO.
JACKSON CO.
HIGH SCHOOLS
CITIES
City

FIGURE 1

political and school boundaries of Ingham County do not coincide exactly. Hence, there are a few students from Eaton, Clinton, Shiawasee, and Livingston Counties who have been included as well.

It was hoped that this geographical area, composed of parts of Ingham and Jackson County, would be representative of the Midwest in many respects. A brief description of the area follows.

Ingham County contains Lansing, the capitol city of Michigan in the north-west corner of its political boundaries. Although students who resided in Lansing proper were not included in this study, many students interviewed came from families whose members worked in the city of Lansing. Lansing was chosen as the site for the state capitol in 1847. The state government had previously been located in Detroit, but a deadlocked legislature finally decided to locate it in what was then a tiny water-power site on the Grand River in the wilderness. In 1848 the community received the name of Lansing, being derived from Lansing, New York, former home of many of its original settlers. A plank road to Detroit was finished in 1852, the city was chartered in 1859, and in 1860 it had a population of 3,074. During the Civil War, industry became important and has remained so until today. First it became a manufacturing center for small steam engines used primarily in farm operations. Then Ransom Eli Olds experimented with steam-powered "horseless carriages" in the late 1880's, switching to gasoline power in 1895. He established the Reo Motor Car Company in Lansing in 1903. Evolution of the city as an automotive center continued with the establishment of several other car companies, and also forging plants.

J. A. Malik describes the development of the geographical distribution of population in Ingham County as follows:

> Lansing was established as a result of the location here of the state capital in 1847. By 1874 the city had become the focus of economic life of the county, as well as the seat of state government, and was home for a quarter of the county's people. By 1900 it had a population of 16,485, or nearly 44 per cent of that of the county. Between 1900 and 1910 growth was particularly rapid, inhabitants increasing 14,744, or nearly 90 per cent in a decade. This growth coincided with the rapid expansion of the automobile industry in the city and gave it 58.6 per cent of the county's population. In 1940 Lansing had about 60 per cent of the county's people, but in 1960 only 51 per cent. Thus, although the city added 29,375 people between 1940 and 1960, giving a population of 180,128 in 1960, the gain was even greater outside of Lansing. Most of this was in East Lansing and in rural non-farm population, with the rest in Mason and the several villages; the farm population declined.
>
> Michigan State University, or Michigan Agricultural College as it was then known, was established in what was later to become East Lansing in 1855. Growth of the college was such that by 1910 there were over a thousand students and East Lansing had some 800 permanent residents. Already some people living here were commuting to jobs in Lansing. During subsequent years this number increased rapidly. East Lansing had a population of 5,839 in 1940. Over the next twenty years growth was spectacular, especially during the 1940's so that by 1960 there was a population of 29,745. Part of the increase was due to greater employment at Michigan State University, where enrollment had grown to over 21,000, and part of it was due to expansion of East Lansing's function as a residential suburb of Lansing.

> During the post-war period a sizeable part of the gain in population of both Lansing and East Lansing has been due to annexations of built-up areas whose inhabitants were previously classified as rural non-farm people. Rural non-farm dwellers in the county increased rapidly after 1910, as more and more people who worked in Lansing established homes outside the city. The rural non-farm population has always been greatest in the northwestern corner of the county, but as ease of commuting increased it has spread farther and farther away from Lansing and East Lansing, especially along the main highways leading into the two cities. This growth and spread has been especially pronounced during the post-war years. There has been an increase of some 27,000 in the rural non-farm population, not counting the large number of rural non-farm dwellers who were taken into the cities by annexation, during this time. Because of the growth of Lansing and East Lansing and of the rural non-farm population around the two cities, the three northwestern townships had 87 per cent of the county's people in 1960, as compared to about 80 per cent in 1940, and less than 53 per cent in 1900.[34]

The remainder of Ingham County is predominantly rural with a great deal of the land devoted to mixed farming. The county as a whole is about 2½% black, and the largest groups of foreign-stock are from Canada, Germany, and the United Kingdom.

The city of Jackson, Michigan, is located 37 miles south of Lansing, in the center of Jackson county. Settlement began in 1829 in this area as it was crossed by nine Indian trails. The city was named Jackson in 1833 after Andrew Jackson, and it received its charter in 1857. Like

---

[34] Johan Ara Malik, "Historical Geography of Ingham County, Michigan." (unpublished Ph.D. dissertation, Department of Geography, Michigan State University, 1960). pp. 298-300.

Lansing, its growth was spurred by the automotive industry. Its industry is now very diversified, and it is the location of the general offices of Consumers Power Company which provides electric and gas service for much of the state. The State Prison of Southern Michigan, one of the largest walled prisons in the world, is 5 miles north of the city. Jackson Junior College, a community college, was established in 1928. The high school population in the city is between 10-15% black, and the foreign stock is mainly central European. The historical development of geographical patterns in Jackson is described in part by R. A. Santer:

> The development of railroads in Jackson has had a profound effect on the character of the city. Not only have they used a significant portion of its land, but they have also influenced the pattern of Central Business District development and the composition of the city's population. During the period of dominant railroad use the Central Business District spread towards the railroad depot, and the stores of the Central Business District thus were closer to one of the city's main pedestrian sources. With the decline of railroad passenger service, the commercial area that was developed in response to the railroad is idle land which has been cleared by urban renewal.
>
> The emergence of Jackson's two largest ethnic groups, the Polish and Germans, is traced to the availability of railroad jobs in Jackson. Initially, as a result of primarily language problems the ethnic groups congregated in their own neighborhoods. However, except for churches, social halls, saloons, and street names, the effects of the existence of Jackson's larger ethnic groups are not generally observable as part of the city's landscape features.
>
> The continued location of Jackson's black citizens in less diffused contemporary housing patterns than the city's foreign stock indicates not only the desire of Negroes to live near each other, but also the impact and tacit enforcement of racial segregation in the community. The

> continued operation of the forces of segregation in the city is diametrically opposite to the process of the general diffusion of members of low-income groups once they have attained higher economic status. Without a change in the attitudes by whites of accepting a greater diffusion of black housing, discontent fostered by racial segregation and job discrimination in the city can be expected to disrupt the peace and tranquility of the community. As a consequence, present-day landscape features may be destroyed.[35]

Suburban residential areas line the northern edge of the city of Jackson, and the remainder of the northern part of the county, which extends to Ingham County, is devoted mainly to mixed farming.

The maps in Figure 2 were derived from 1960 U.S. Census Data, and give a further idea of the survey area. Areas of high income, for example, are concentrated in East Lansing, and a small part of urban and suburban Jackson. Densely occupied housing units are concentrated in one area of Meridian Township and Holt. As might be expected, the highest median school years completed region is in East Lansing where Michigan State University is located. The black population of the survey area is confined almost totally to six census tracts in urban Jackson.

---

[35]Richard Arthur Santer, "A Historical Geography of Jackson, Michigan: A Study on the Changing Character of an American City 1829-1969." (unpublished Ph.D. dissertation, Department of Geography, Michigan State University, 1970). pp. 291-292.

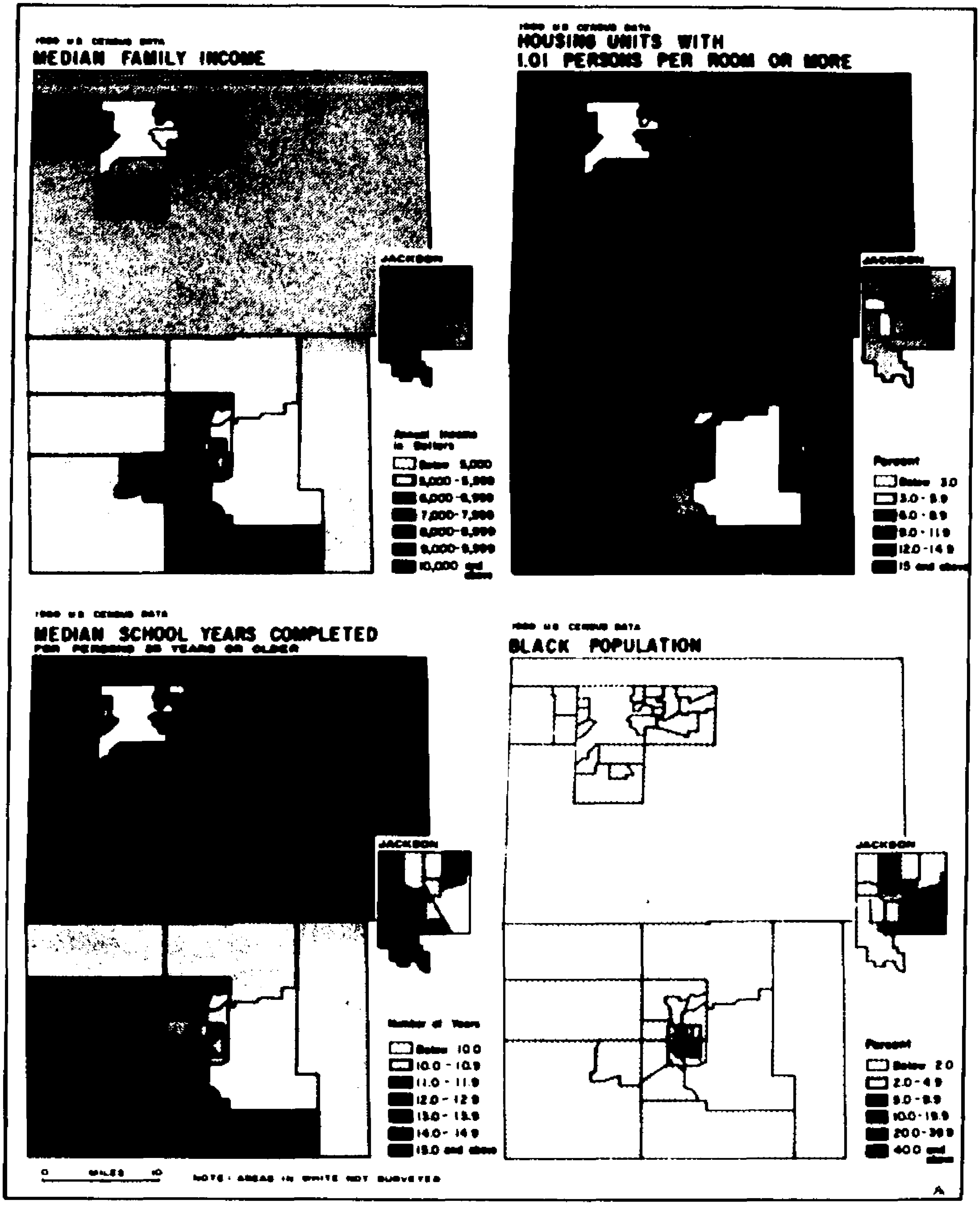
MEDIAN FAMILY INCOME
HOUSING UNITS WITH
1.01 PERSONS PER ROOM OR MORE
MEDIAN SCHOOL YEARS COMPLETED
BLACK POPULATION
JACKSON

FIGURE 2

CHAPTER 2

METHODOLOGY

Description of Sample

Public high school students of both sexes in grades 10, 11, and 12 were selected to test the hypothesis that spatial variation does exist in food intake. There were several reasons for using this particular group rather than other groups such as families or college students. These high school students, for the most part, still lived and ate most of their meals at home, and thus reflected their familys' food habits to a large extent. Although they lived throughout Ingham and Jackson Counties, they came together at one of 14 focal points, i.e., the public high schools where they could be conveniently measured and interviewed. (See Figure 1). It was possible, either working through the Student Teacher Center at Michigan State University or by direct contact with the high school principal, to make arrangements to interview the students at school, thus cutting down the time cost of the interviewer, as well as insuring a reasonably high response in data collection. Finally, from the standpoint of the nutritionist, it has been demonstrated that the teenage girl is the most poorly fed member of the American family in terms of the percentage of recommended nutrients consumed.[1] On

[1] Agnes Fay Morgan, p. 6.

the other hand, the Ten State Nutrition Survey concluded that the adolescent males in their study had even more evidence of malnutrution than did the females.[2] By studying both sexes of this age group, then, valuable information and meaningful contrasts could be obtained for planning nutrition education programs, for example, where maximum effectiveness of such a program could only be achieved if there was some understanding of food habits that existed within the area.

Pilot Study

In order to test the instrument which was used to collect the data on food habits, a questionnaire, a pilot study was conducted in the fall of 1967. This was done by working with high school girls in the home economics classes of two of the high schools involved in the total study--Waverly and Okemos. A preliminary instrument was constructed and tested on these girls to give an indication of its workability, and also to help select specific information to be asked for in the final questionnaire. A total of 35 students were interviewed, and a final questionnaire was developed for use in data collection. (Appendix A).

Data Collection and Sampling

As of September, 1967, there were a total of 9,071 pupils of both sexes enrolled in grades 10, 11, and 12 of the 14 high schools involved in the study. When application

---

[2] U.S. Department of Health, Education and Welfare, p. 7.

was made to visit each of the high schools in the winter and spring of 1968, it was requested that slightly more than 10% of the students be interviewed. This would have provided a sample size of close to 1,000. While most schools were extremely cooperative, certain difficulties were encountered. In Mason, interviewing was allowed in only one physical education class, and that was on a limited basis. Hence, the sample size there was small. In East Lansing, no interviewing was permitted during the school day, but students were allowed to volunteer to be interviewed, and they were met in the school, but after school hours. Although the entire 10th, 11th and 12th grades were contacted, only 37 students were interviewed. When it became apparent that the total number of students to be interviewed would fall short of the desired goal, the principal at Parkside High School in Jackson was again contacted to arrange for more students. This particular school was chosen as it seemed desirable to interview more black students from an urban area, as the rural and suburban areas, which contain an almost exclusively white population, had been more thoroughly covered.

Although every attempt was made to insure the randomness of the sample of students interviewed, it was necessary to work within the confines of the schools' schedule. In general, the schools permitted interviewing during study hall hours. However, in the Waverly High School, and the Okemos High School, the interviewing was done on a series of days during the noon hour period. This still involved selecting from the total student body, as students were not permitted to leave the building over the lunch hour. The problems of interviewing at the Mason High School and East Lansing High School have already been mentioned.

The interviews were conducted in one of two ways, again depending upon the desires of the school's administration. One method of interviewing was to talk to each student individually, and then the interviewer would write the information on the questionnaire. A second method of interviewing was the group method. Here the author would go through the questionnaire item by item and explain what was wanted, and the students would then fill in the information. An assistant, a senior nutrition student at Michigan State University, was available to answer any questions, and to check each paper for completeness and readability as it was handed in. For both methods, the students were weighed and measured for height either before or after the interview. Table 1 indicates the dates the interviews were conducted, the method used to secure the information, and the source of the students.

In order to insure that the sample was somewhat proportional to the school's population, not only was a sample size of about 10% secured, but an attempt was made to subdivide it to include 10% from both sexes in each of the three grades. Enrollment by sex for each grade was available for each school, with the exception of the Okemos High School where records were kept by grade alone. Table 2 indicates this subdivision.

TABLE 1

Dates Interviews Were Conducted, Types of Interviews, and Source of Students for Survey

High School	Date(s) Interviews Were Conducted	Type of Interview	Source of Students
Parkside	April 26, 1968 May 24, 1968	Group Group	Study Halls Home Economics & Industrial Arts Class
Jackson	May 3, 1968	Group	Study Halls
Northwest	May 22, 29, June 5, 1966	Individual	Study Halls
East Lansing	April 24, May 1, May 8, 1968	Individual	Volunteers after School
Okemos	April 2-April 5, 1968	Individual	Cafeteria (noon hour)
Waverly	February 20 - Feb. 23, May 21, May 23, 1968	Individual	Cafeteria
Haslett	March 29, 1968	Individual	Study Halls
Holt	February 27, 1968	Group	Study Halls
Leslie	March 12, 1968	Individual	Study Halls
Mason	March 5 - March 7, 1968	Group	Physical Education Class
Stockbridge	March 13, 1968	Individual	Study Halls
Weberville	January 24, 1968	Individual	Study Hall
Williamston	February 14, 1968	Individual	Study Hall
Dansville	January 23, 1968	Individual	Study Hall

TABLE 2

Enrollment and Sample Size of High School Populations Surveyed

High Schools	Total Enrollment	Total Sample Obtained	Boys-10th Enr.	Boys-10th Sample	Boys--11th Enr.	Boys--11th Sample	Boys-12th Enr.	Boys-12th Sample
Parkside	1373	222	252	47	242	39	188	18
Jackson	1484	151	280	33	270	24	226	18
Northwest	608	70	132	13	103	14	79	9
East Lansing	1041	37	178	6	173	4	184	5
Okemos	626	69		13		11		11
Waverly	835	102	163	19	159	21	110	11
Haslett	337	36	61	6	47	5	53	5
Holt	707	97	129	15	118	14	88	6
Leslie	312	36	50	4	51	6	49	8
Mason	689	37	131	9	110	5	113	5
Stockbridge	390	40	71	4	69	8	55	8
Weberville	140	28	26	8	26	6	20	3
Williamston	322	35	55	7	53	5	48	4
Dansville	207	24	43	4	37	4	24	4

TABLE 2--Continued

Enrollment and Sample Size of High School Populations Surveyed

High Schools	Total Enrollment	Total Sample Obtained	Girls-10th Enr.	Girls-10th Sample	Girls--11th Enr.	Girls--11th Sample	Girls--12th Enr.	Girls--12th Sample
Parkside	1373	222	258	26	216	36	217	56
Jackson	1484	151	261	25	222	25	225	26
Northwest	608	70	128	14	94	10	72	10
East Lansing	1041	37	176	4	173	13	156	5
Okemos	626	69		11		12		11
Waverly	835	102	136	17	148	23	106	11
Haslett	337	36	69	7	68	7	40	6
Holt	707	97	143	27	123	17	96	18
Leslie	312	36	56	5	58	7	48	6
Mason	689	37	116	4	118	10	99	4
Stockbridge	390	40	64	5	50	4	53	11
Weberville	140	28	20	0	23	5	25	6
Williamston	322	35	69	5	52	12	46	2
Dansville	207	24	33	4	41	4	26	4

The Questionnaire

As was noted in Chapter 1, the unit of measurement, food habits, is composed of a combination of factors. Therefore, a variety of information was collected from each subject to indicate not only specific consumption of food items, but also to find out his attitude toward certain foods. In addition, certain socio-economic data were also secured in order to attempt to explain the differences in food habits which were hypothesized to exist. The questionnaire used to collect all of this information appears in Appendix A.

Twenty-four Hour Recall

Most of the first two pages of the questionnaire was devoted to a 24-hour food consumption recall for the subject being interviewed. This gave information on the total kind and amount of food eaten in the 24 hours just previous to the interview. This method for obtaining food habits has been shown to be more efficient and equally accurate when compared to other methods of collecting data for population groups (as opposed to individuals).[3] As the final analysis was to be done mainly in terms of enumeration areas (census tracts), this method, then, seemed ideal. The interviews

---

[3]Charlotte M. Young et al., A Comparison of Dietary Study Methods. II. Dietary History vs. Seven-Day Records vs. 24-Hour Recall. J. Amer. Diet. Assoc. 28:218, 1952.

were done on days other than Monday, as weekend food habits are often erratic when compared to those of week days.

The student was asked to recall all of the food he had eaten in the past 24 hours, beginning with the last meal or snack eaten, and then working backward until the same time on the previous day. In addition to telling what he had had to eat, he was asked to give certain other information about each item of food. In order to assess more accurately the quantities of food involved, food models were used so the subject could describe amounts of food eaten as accurately as possible. Various size cups, glasses, bowls and spoons were shown so the subject could select the size which most closely corresponded with what he had used. In addition, food models constructed from paper were prepared by adapting suggestions from an article by Margaret C. Moore et al.[4] These were extremely helpful in estimating cake, cookie, pie, and meatloaf sizes, for example. When conducting interviews by the group methods, these models were made available to all members of the group so they could inspect them closely, rather than at a distance.

Of course, under the circumstances of the interview, there was no way of checking on the complete accuracy of the information given by each subject. However, it was possible to check on the kind and amount of food consumed in the

---

[4]Margaret C. Moore et al., Using Graduated Food Models in Taking Dietary Histories. J. Amer. Diet. Assoc. 51:447, 1967.

school lunch, when a student ate this. In general, their reporting was extremely accurate in describing size of servings as well as items consumed.

Other information was collected about each food item eaten. The student was asked when he ate the food, whether it was part of a meal or a snack, whether it was eaten alone, with some or all of his family, or with friends, and finally, where it was eaten.

In addition to food items consumed, other information related to food habits was requested. As mentioned previously, heights and weights were obtained for each student by taking a scale and a measuring device into each school. Whether or not a vitamin preparation was taken, and how often was ascertained. The person or persons usually responsible for food purchasing and food preparation in the family were also asked for. Finally the student was given a list of food items to rate according to how well he liked or disliked each item. The scale used to rate the foods was from 1 (like very much) to 5 (dislike very much) with 3 being neither like nor dislike. A sixth category was included to indicate that the student was unfamiliar with the food. The 20 food items on the list were chosen by asking the students in the pilot study to list five favorite foods and five they disliked. The ones used on the questionnaire were those items mentioned by several students, particularly those that appeared in both categories. It was hoped that in this way, contrasts among groups might be noted.

Although no clinical nutritional assessment was attempted, the heights and weights obtained were used in establishing a weight-height ratio. In addition to this, the subject was asked to indicate whether or not he was a diabetic, as this would (or should) affect his food habits significantly. He was also asked to list any major illnesses he had had in the past five years.

Finally, certain other information was elicited from the subjects which might be classified as socio-economic data. The student provided information on whether or not he worked, at what job, and how many hours per week; his father's age, occupation, and educational level; his mother's age, educational level, and nature and extent of her occupation outside the home; the age, number, and sex of all children living at home; the region or country of origin of his parents and grandparents; the number of changes of residence he has made in the past five years; and his family's religion. As each questionnaire was finished, the interviewer noted on it whether the subject was white or non-white.

Before any statistical analysis was undertaken, each subject was located by his residence on a map, and the census tract in which he lived was noted on his questionnaire. For those students from the city of Jackson, the city block in which they lived was also noted.

United States Census Tract Data

The enumeration area used in this study was the census tract. The census tract is defined by the U.S. Census Bureau as follows:

> Definition of census tract.--Census tracts are small areas into which large cities and adjacent areas have been divided for statistical purposes. Tract boundaries were established cooperatively by a local committee and the Bureau of the Census, and were generally designed to be relatively uniform with respect to population characteristics, economic status, and living conditions. The average tract has about 4,000 residents. Tract boundaries are established with the intention of being maintained over a long time so that comparisons may be made from census to census.[5]

There were two advantages for using the census tracts as the enumeration areas. In the first place, it was a meaningful way to group the data collected from close to 1,000 students, and subdivide it into workable units, both for the statistical analysis and for the mapping. Secondly, additional socio-economic data for the census tracts involved in the study could be elicited from the 1960 census figures and incorporated into the present study. For example, family income might well be an economic factor related to food habits, but this information was not obtainable from the subjects. It was, however, available by census tract from the 1960 figures and was used in several parts of the analysis. Therefore, in addition to the data collected in the present

---

[5] U.S. Bureau of the Census, U.S. Census of Population and Housing: 1960, Census Tracts. Final Report PHC(1)-73, U.S. Government Printing Office, Washington, D.C., 1962, p. 1.

study, other data was added from the 1960 U.S. Census Tract publications.

The use of census tract data in research has been meaningfully, if not widely used according to Donald L. Foley. He states that "the research most directly promoted has been that dealing with the differential characteristics of urban residential subareas within the large cities, being conveniently subsumed under the label, human ecology." In identifying the main ways in which tract statistics have been used in methodological terms, he identifies one pattern as "the interpretation of individuals' characteristics in terms of general social environment of the tract. . .the former emerge from the specific study while the latter is available in the form of previously published tract statistics." It is in this manner that U.S. Census Tract statistics have been incorporated into the present study. To support geographical interpretation of this kind of research, Foley has pleaded the case for "ecological correlation where it is clearly understood that the characteristics being correlated are meaningfully interpretable in areal as well as (or instead of) individual terms."[6]

United States City Block Data

The United States Census Bureau has made available data on even smaller areal units than a census tract, the

---

[6]Donald L. Foley, Census Tracts and Urban Research, Amer. Statistical Assoc. J. 48:733, 1953.

city block. The type of information available for this enumeration area deals only with housing characteristics. The U.S. Census Bureau states:

> The information presented in this report represents a modification of the block statistics programs of the 1950 and 1940 Censuses of Housing. The 1960 program provides the following information for each block: Total population, the number of housing units classified by condition and plumbing, tenure of occupied units, average value and average number of rooms for owner occupied units, average contract rent and average number of rooms for renter occupied units, number of units occupied by nonwhites, and number of units with 1.01 or more persons per room. All of the items were enumerated and tabulated on a 100-percent basis for the statistics in this report.[7]

In terms of this study, the only area considered for which city block data was available was the city of Jackson. However, students from the city proper were interviewed, and they were coded according to the city block in which they lived. Housing characteristics for these city blocks were then noted, and certain correlations between food habit characteristics for individuals and city block data were carried out.

Statistical Analysis

Before any statistical analysis of the collected data could be undertaken, it was necessary to convert the data to a form utilizable by the computers at Michigan State

---

[7] U.S. Bureau of the Census, U.S. Census of Housing: 1960, Volume III City Blocks. Series HC(3), No. 210, U.S. Government Printing Office, Washington, D.C., 1961, p. III.

University Control Data Corporation 3600 and 6500. Therefore, the data obtained for each student was coded numerically and punched on cards with an identifying number for the subject, plus a code number for the census tract in which he resided. Those subjects living in the city of Jackson also had their city block number listed. Most of the coding was straightforward, and posed no particular problems. Occupations of the subjects and their parents were coded according to the United States Bureau of the Census Occupational Classification.[8] Depending upon the total number of food items consumed by the subject, there were from four to ten cards punched per subject.

Initial Analysis of Data

The next step was to transfer this raw data into variables which could be used to analyze food habits, nutritional status, and socio-economic and cultural characteristics for each subject. The Consumer and Food Economics Research Division of the United States Department of Agriculture has devised a system for the mechanical computation of nutrients consumed by individuals when such data is reported in food intake surveys.[9] This system was employed in the present study both to determine the nutrients

[8] U.S. Bureau of the Census, U.S. Census of Population and Housing, p. XXI.

[9] Elizabeth Davenport, Calculating the Nutritive Value of Diets, United States Department of Agriculture, Agricultural Research Service Bulletin 62-10-1, 1964.

consumed in the 24-hour period recorded and also to classify the foods consumed by type, such as milk, eggs and bread. For calculating the nutritive value of the food consumed, a computer program was developed which utilized two sets of input data--one which gave the quantities of food consumed (the cards punched for each subject as described previously), and the other with nutritive values per specified units of food. Punched cards were available from the Consumer and Food Economics Research Division for many of the food items. For those not available, the author prepared her own. Each food had a six-digit identification code. The first three digits identified the food item and its respective unit of measure. This information was used to determine total nutrient intake of each subject. The second three digits designated foods by groups or categories. These categories were used to determine numbers of servings of various types of foods consumed by each subject.

In addition to securing total amounts of nutrients consumed, the nutrient intake data was converted into the per cent of the Recommended Dietary Allowances established by the National Research Council, 1968, for the 14-18 year old age group.[10]

Weight-height ratios were used to determine into which class each subject fell according to the system of Sargent.[11]

---

[10]National Academy of Sciences, Recommended Dietary Allowances.

[11]Dorothy W. Sargent, Weight-Height Relationships of Young Men and Women. Amer. J. Clin. Nutr. 13:318, 1963.

Thus, each student for his weight, height, and sex, was designated as (1) underweight, (2) slender, (3) normal, (4) stocky, (5) overweight, and (6) obese. All other data was transformed into numerical values so that they could be analyzed statistically. Thus, a total of 268 variables were determined for each of 911 subjects whose original questionnaires were complete. Table 3 gives a list of these variables.

TABLE 3

Food Habit, Nutritional, and Socio-Economic Variables Determined from Survey Data

No.	Variable
1	Kilocalories
2	Protein--grams
3	Fat--grams
4	Carbohydrate--grams
5	Calcium--mgs
6	Iron--mgs
7	Vitamin A--I.U.'s
8	Thiamin--mgs
9	Riboflavin--mgs
10	Niacin--mgs
11	Ascorbic acid--mgs
12	% R.D.A.--calories
13	% R.D.A.--protein
14	% R.D.A.--calcium
15	% R.D.A.--iron
16	% R.D.A.--vitamin A
17	% R.D.A.--thiamine
18	% R.D.A.--riboflavin
19	% R.D.A.--niacin
20	% R.D.A.--ascorbic acid
21	% calories from meals
22	% calories from snacks
23	% calories alone
24	% calories with all of family
25	% calories with some of family
26	% calories with friends
27	% calories at home
28	% calories at school
29	% calories elsewhere
30	% protein from meals
31	% protein from snacks
32	% protein alone
33	% protein with all of family
34	% protein with some of family
35	% protein with friends
36	% protein at home
37	% protein at schools
38	% protein elsewhere
39	Milk and milk products--no. of servings
40	Protein foods--no. of servings
41	Vegetables--no. of servings
42	Fruits--no. of servings
43	Grain products--no. of servings
44	Fats and oils--no. of servings
45	Sugars and sweets--no. of servings
46	Milk and milk drinks-- no. of servings
47	Cream, ice cream, milk desserts--no. of servings
48	Cheese--no. of servings
49	Meat, poultry, fish--no. of servings
50	Eggs--no. of servings
51	Legumes--no. of servings
52	Nuts--no. of servings
53	Protein mixtures--no. of servings
54	Potatoes--no. of servings
55	Dark green, deep yellow vegetables--no. of servings
56	Tomatoes--no. of servings
57	Other vegetables--no. of servings
58	Vegetable mixtures--no. of servings
59	Citrus fruits--no. of servings
60	Dried fruits--no. of servings
61	Other fruits--no. of servings
62	Whole grain or enriched--no. of servings
63	Other grain products--no. of servings
64	Grain mixtures--no. of servings
65	Sugars, sirups, candy--no. of servings
66	Soft drinks and dessert powders--no. of servings

TABLE 3--Continued

No.	Variable
67	Fresh fluid milk--no. of servings
68	Milk drinks--no. of servings
69	Frozen desserts--no. of servings
70	Beef--no. of servings
71	Pork--no. of servings
72	Veal, lamb--no. of servings
73	Liver--no. of servings
74	Game and luncheon meat--no. of servings
75	Poultry--no. of servings
76	Fish--no. of servings
77	Whole grain or enriched cereals and pastes--no. of servings
78	Whole grain or enriched bread--no. of servings
79	Whole grain or enriched—other--no. of servings
80	Non-enriched cereals and pastes--no. of servings
81	Non-enriched bread--no. of servings
82	Non-enriched--other--no. of servings
83	Sugar--no. of servings
84	Sirups and honey--no. of servings
85	Jellies and jams--no. of servings
86	Candies--no. of servings
87	Soft drinks--no. of servings
88	Ices, popsicles, gelatin--no. of servings
89	Weight-height ratio
90	Who purchases food--mother (1-yes, 0-no)
91	Mother and self
92	Mother, self and other family members
93	Mother and father
94	Father
95	Self
96	Self and other family members except mother
97	Grandmother
98	Other
99	Who prepares food--mother (1-yes, 0-no)
100	Mother and self
101	Mother, self and other family members
102	Mother and father
103	Father
104	Self
105	Self and other family members except mother
106	Grandmother
107	Other
108	Vitamin preparation (1--yes, 2--no)
109	Age
110	Grade (1--10, 2--11, 3--12)
111	Sex (1--male, 2--female)
112	Color (1--white, 2--non-white)
113	# of illnesses in past 5 years
114	Rheumatic fever (1--yes, 2--no)
115	Pneumonia (1--yes, 2--no)
116	Bronchitis (1--yes, 2--no)
117	Mononucleosis (1--yes, 2--no)
118	Tonsilitis (1--yes, 2--no)
119	Measles (1--yes, 2--no)
120	Subject's work--hrs/week
121	Father's age
122	Father's level of education
123	Mother's age
124	Mother's work--hrs/week
125	No. of moves in past 5 years
126	No. of brothers and sisters
127	Father's occupation--professional (1--yes, 0--no)
128	Farmer
129	Manager
130	Clerical

TABLE 3--Continued

No.	Variable
131	Sales
132	Craftsman
133	Operatives
134	Private household worker
135	Service worker
136	Farm laborer
137	Other laborer
138	Father's origin--Michigan (1--yes, 0--no)
139	North Central
140	Other
141	Mother's origin--Michigan (1--yes, 0--no)
142	North Central
143	Other
144	Religion--Protestant (1--yes, 0--no)
145	Catholic
146	Jewish
147	Mixed
148	Other or none
149	Attitudes towards foods--french fried potatoes--1 (1--yes, 0--no)
150	2
151	3
152	4
153	5
154	6
155	Lasagne--1 (like very much)
156	2 (like slightly)
157	3 (neither like nor dislike)
158	4 (dislike slightly)
159	5 (dislike very much)
160	6 (unfamiliar with it)
161	Chili con carne--1
162	2
163	3
164	4
165	5
166	6
167	Chop suey--1
168	2
169	3
170	4
171	5
172	6
173	Fried calves liver--1
174	2
175	3
176	4
177	5
178	6
179	Sauerkraut--1
180	2
181	3
182	4
183	5
184	6
185	Pizza--1
186	2
187	3
188	4
189	5
190	6
191	Fried scallops--1
192	2
193	3
194	4
195	5
196	6
197	Cooked spinach--1
198	2
199	3
200	4
201	5
202	6
203	Pancakes--1
204	2
205	3
206	4
207	5
208	6
209	Spaghetti with tomato meat sauce--1
210	2
211	3
212	4
213	5
214	6

TABLE 3--Continued

No.	Variable	No.	Variable
215	Cooked cauliflower--1 (like very much)	263	Oatmeal--1
216	2 (like slightly)	264	2
217	3 (neither like nor dislike)	265	3
218	4 (dislike slightly)	266	4
219	5 (dislike very much)	267	5
220	6 (unfamiliar with it)	268	6
221	Cooked beets--1		
222	2		
223	3		
224	4		
225	5		
226	6		
227	Chocolate cake--1		
228	2		
229	3		
230	4		
231	5		
232	6		
233	Baked custard--1		
234	2		
235	3		
236	4		
237	5		
238	6		
239	Whole milk--1		
240	2		
241	3		
242	4		
243	5		
244	6		
245	Cola beverages--1		
246	2		
247	3		
248	4		
249	5		
250	6		
251	Hard-cooked eggs--1		
252	2		
253	3		
254	4		
255	5		
256	6		
257	Pork chops--1		
258	2		
259	3		
260	4		
261	5		
262	6		

Basic Statistics

Census Tract Averages

As the enumeration areas used in this study to investigate spatial variation were census tracts, it was necessary to combine information for each variable obtained from the total number of subjects in each census tract. This was done by computing the arithmetic mean for each variable considered for each census tract. These averages were used as the basis for the histograms produced, and many of the maps used in the analysis that follows.

It should be noted that there was considerable variation in the number of subjects in the different census tracts. This was due, at least in part, to the fact that school district boundaries did not coincide with census tract boundaries. In order to obtain some idea of the proportion of high school students interviewed in each census tract, the total number of subjects interviewed from each census tract was divided by the 1960 Census Bureau figure for population in that tract in the 15-19 year old age group. This was done for the total population, as well as for males and females separately. The results are given in Table 4 and are shown spatially in Figure 3.

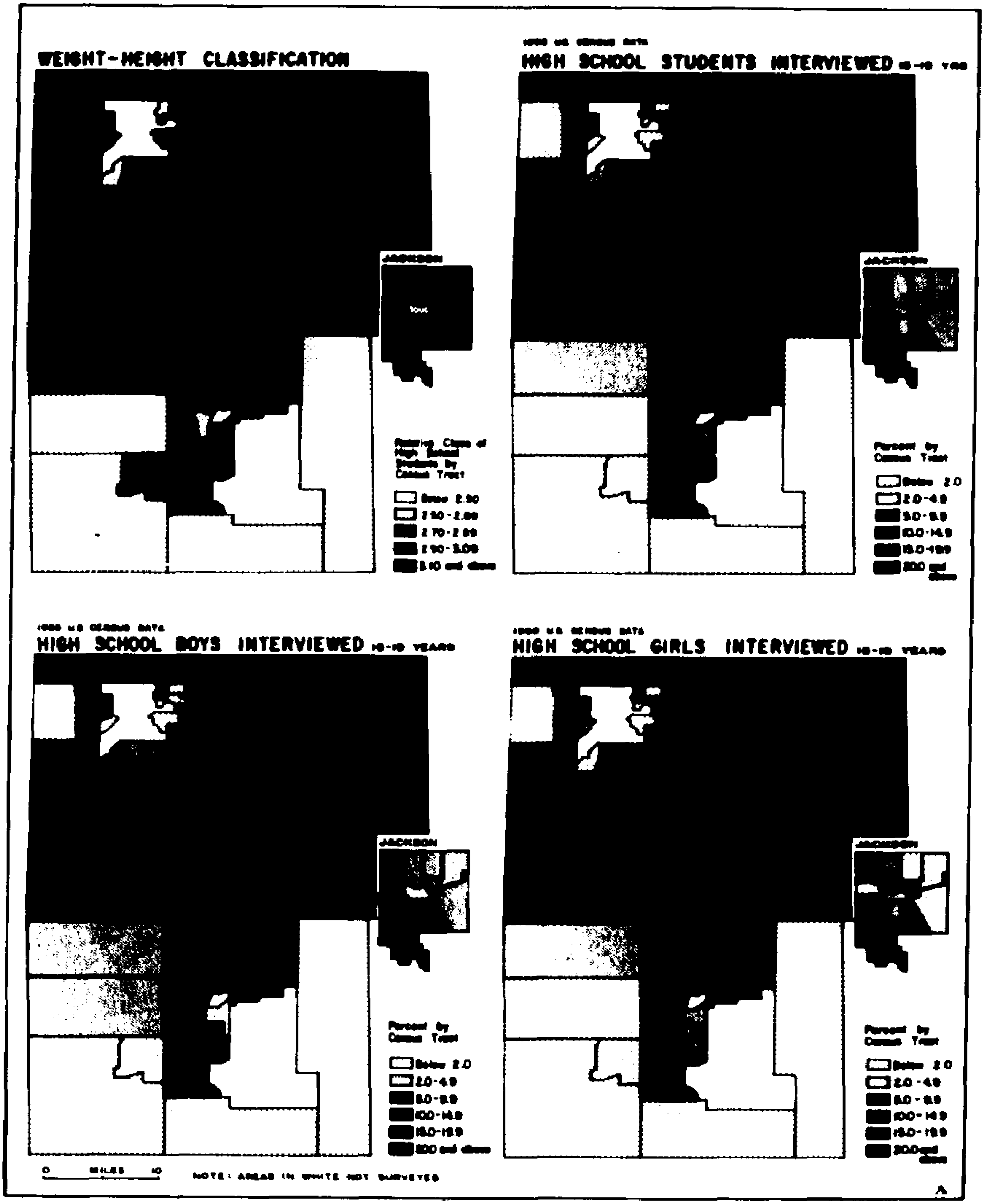
WEIGHT-HEIGHT CLASSIFICATION
HIGH SCHOOL STUDENTS INTERVIEWED
HIGH SCHOOL BOYS INTERVIEWED
HIGH SCHOOL GIRLS INTERVIEWED
JACKSON
Percent by Census Tract
Below 2.0
2.0-4.9
5.0-9.9
10.0-14.9
15.0-19.9
20.0 and above

FIGURE 3

TABLE 4

Subjects Interviewed by Census Tracts

Census Tract	Total Subjects	Boys	Girls	% of 15-19 Year Olds 1960 U.S. Census Data	Boys	Girls
J-01	14	8	6	5.4	5.5	5.2
J-02	13	5	8	4.3	3.9	4.7
J-03	5	4	1	2.5	3.9	1.0
J-04	17	9	8	3.8	4.4	3.6
J-05	5	4	1	2.6	4.2	1.0
J-06	4	1	3	2.2	1.4	2.7
J-07	8	2	6	4.8	2.4	7.0
J-08	46	23	23	13.1	13.4	12.9
J-09	23	10	13	8.0	7.1	8.8
J-10	11	4	7	3.7	3.2	4.1
J-11	29	15	14	10.9	12.5	9.6
J-12	22	9	13	4.6	4.3	4.8
J-13	39	15	24	16.2	12.6	19.7
J-50	13	5	8	5.2	4.3	5.8
J-52	48	22	26	23.4	19.3	28.1
J-53	51	28	23	15.2	16.5	13.9
J-54	3	2	1	0.9	1.4	0.5
J-55	18	9	9	6.4	6.3	6.5
J-56	17	11	6	20.4	23.0	17.0
J-57	13	5	8	7.0	5.4	8.3
J-59	3	1	2	2.1	1.5	2.6
J-63	1	1	0	0.3	0.6	0.0
J-64	1	1	0	0.2	0.4	0.0
J-65	5	3	2	1.7	2.3	1.3
J-66	7	4	3	2.9	3.1	2.6
J-67	35	19	16	7.4	8.3	6.5
J-68	3	1	2	0.8	0.5	1.4
L-17	2	0	2	1.9	0.0	3.3
L-34	33	16	17	22.3	18.7	26.0
L-35	19	11	8	7.1	9.0	5.6
DT-201	36	23	13	14.0	18.3	9.9
DT-202	9	1	8	9.0	2.1	15.4
DT-203	1	1	0	0.5	1.0	0.0
EL-38	9	4	5	7.5	7.7	7.4
EL-39	6	1	5	2.1	0.6	4.0
EL-40	4	2	2	1.2	1.1	1.3
EL-43	11	3	8	4.9	2.2	9.1
EL-44	4	4	0	0.5	0.6	0.0
MT-45	1	0	1	0.8	0.0	2.0
MT-46	12	5	7	9.1	8.1	10.1
MT-47	9	5	4	5.4	6.4	4.6
MT-48	15	7	6	9.3	10.0	8.8

TABLE 4--Continued

Census Tract	Total Subjects	Boys	Girls	% of 15-19 Year Olds 1960 U.S. Census Data	Boys	Girls
MT-49	48	23	25	14.9	13.8	16.1
MT-50	14	8	6	11.8	12.1	11.5
DH-52	4	3	1	3.1	4.6	1.6
DH-53	13	5	8	5.2	4.5	5.8
DH-54	42	12	30	13.0	7.1	19.7
DH-55	23	7	16	12.8	8.4	16.7
Untracted	215	105	110	8.5	8.2	8.8

Histograms

The census tract averages obtained were used to produce histograms showing the frequency distribution by census tract for each variable considered. The histograms were produced by the computer, and were arranged in width by standard deviations from the variable mean, and in height by the number of census tracts falling in each quarter standard deviation. An example is given in Figure 7, p. 155.

Spatial variation can thus be deduced from these histograms, as those with a wide spread over a range of standard deviations can be interpreted as indicating considerable spatial variation for that variable. On the other hand, histograms with a clustering of most census tracts around the mean would indicate little, if any, variation over space.

Correlation Coefficients

In an attempt to determine whether or not relationships existed between, on the one hand, nutritional and food habit variables, and, on the other, socio-economic and cultural variables, a series of correlation coefficients was determined. These correlation coefficients, then, indicated the degree and direction of the relationship between any two variables selected, and would thus assist in locating those socio-economic and cultural variables important in determining food and nutrition behavior.

Correlation coefficients were determined for three sets of data. The first set involved both the food and nutritional variables, and the socio-economic and cultural variables obtained from this study. These are given in Appendix B. Since the number of subjects included in the final study was 911, correlation coefficients of .067 and over were significant at the 5% level, and correlation coefficients of .088 and over were significant at the 1% level.

The next two sets of data involve a more spatial approach in that the second set included the variables on nutrition and food habits from this study, and these were correlated with selected variables from 1960 United States Census Tract data as published by the United States Census Bureau for Ingham and Jackson Counties.[12] The variables chosen were ones that the researcher felt might well have influenced food consumption behavior, and included such categories as percentage of foreign stock residing in the census tract, income, education, percentage of unemployed people, occupations, and housing conditions. These results are reported in Appendix C, and include the 648 subjects who lived in tracted areas of the total area surveyed. The third set of data involves the food and nutritional variables for the residents of the city of Jackson only, and these were correlated with selected variables from the United States Census Bureau on city block data within Jackson.[13]

---

[12]U.S. Bureau of the Census, U.S. Census of Population and Housing: 1960, Census Tracts.

[13]U.S. Bureau of the Census, U.S. Census of Housing: 1960.

Variables selected again included those which were felt might have a bearing on food habits. These are shown in Appendix D, and include data for the 211 subjects in the study who reside in the city of Jackson.

In the last two correlation matrices described, each subject was assigned the census tract, or the city block variables reported for his own place of residence. Thus, a subject living in Census Tract J-01 was assigned the median family income for that census tract of $9,800 per year.

Factor Analysis

Factor analysis was selected as a multivariate statistical technique to use in an attempt to determine if there were any underlying factors present in the large number of variables secured on both nutritional and food habit items, as well as socio-economic and cultural items for the subjects in the study. "Basically, factor analysis is a technique which can be used to take a large number of operational indices and reduce them to a smaller number of conceptual variables."[14]

From the original data collection, 268 variables--226 on food habits and nutritional status, and 42 on socio-economic and cultural status--had been used in the analysis up to this point. However, as the Factor A program developed by the Computer Institute for Social Science Research at Michigan State University can only handle 100 variables in a

---

[14] H. S. Blalock, Social Statistics. McGraw Hill: New York, 1960, p. 383.

single factor analysis, 96 of the original 268 variables were selected on the basis of a preliminary subjective analysis. The Factor A program provided a principal component solution and an analytic orthogonal rotational solution from the observed data on the 96 selected variables. The rotated factors produced were limited to 10. The results of this factor analysis will be presented and discussed in Chapters 4 and 6, in discussions dealing with the total survey population.

A further step was carried out from the factor analysis solutions obtained in order to gain insight into any spatial variations that might exist. This was done using the factor scores. These factor scores were obtained for each subject on the ten rotated factors which were extracted. Subjects had high or low factor scores as their values were high or low on the variables entering the particular factor extracted. Thus, the factor scores could be used to compare subjects within the factor. In order to introduce the spatial component, census tract averages for the factor scores were determined in the same way as for other variables already discussed.

Mapping

In addition to a map indicating the geographical area surveyed (Figure 1), a series of maps was constructed to illustrate various food habit characteristics and socio-economic data derived from the study. These maps were constructed using census tracts as enumeration areas, and the quantitative figure assigned to each census tract in each map was computed by taking the arithmetic mean for all subjects residing in that census tract. In addition selected 1960 U.S. Census Tract data was also mapped to illustrate pertinent socio-economic factors not available from the subjects. For example, the maps in Figure 3 include both kinds. The weight-height classification map was derived from census tract averages obtained from this study, while the maps of the high school students interviewed were based on population data from the 1960 U.S. Census.

CHAPTER 3

FOOD HABITS OF THE TOTAL SURVEY POPULATION

As indicated previously, the study of food habits covers all aspects of an individual's food consumption from the time the food is actually selected for him (or by him) to its ultimate digestion and utilization. The following results which deal with many facets of the subject's attitude towards as well as consumption of food, are all pertinent from the standpoint of understanding more precisely the food habits of adolescents. Only by studying the broad spectrum of factors influencing what the teenager eats as well as what he actually consumes, will a more understandable picture of his nutritional status emerge.

Total Nutrients Consumed

The initial analysis done on data for individuals resulted in figures for intakes of the various nutrients as derived from the foods eaten by each subject. The methodology employed to obtain these figures was described in Chapter 2. The correlation coefficients discussed in this section are those determined from the 911 subjects in the present study, and do not include any U.S. Census Tract or City Block statistics. An analysis of the total nutrients consumed as percentages of the Recommended Dietary Allowance will be given in Chapter 4.

<u>Energy Foods</u>

The mean number of grams of carbohydrate consumed by the subjects in this study was 292 with the lowest quartile consuming 188 grams or less and the highest quartile 367 grams or more. One subject in the study had had nothing to eat for the 24 hours previous to the interview, and hence had zero values in all categories. The mean fat intake was 116 grams for the 24 hour period. The lowest quartile consumed 72 grams or less and the highest quartile 152 grams or more. The intake of protein, important as a building material and also as an energy food, ranged from the lowest quartile values of 60 grams to the highest quartile values of 115 grams with a mean intake of 91 grams for the 24 hour period surveyed. These three nutrients make up the energy producing substances ingested by the body, and hence determine the intake of kilocalories. Caloric values ranged from the lowest quartile values of 1655 to the highest quartile values of 3244 for the period surveyed with a mean of 2538. This mean figure is quite comparable to the mean caloric intake found for 16-year old boys and girls in the interregional United States nutrition study mentioned previously. In that study, the figure for mean caloric intake, when male and female intakes are averaged, was 2650 per day. For protein, the mean intake was 86 grams daily for the same age group.[1] It should be mentioned that very high energy intakes were

---

[1]Morgan, p. 31.

reported for two boys who worked at a local smorgasbord restaurant, and, at least for the evening involved in their 24-hour recall, reported consuming very large quantities of food.

Minerals

The two mineral nutrients assessed in this study were calcium and iron. Calcium is especially important during the growth spurt for adolescents as it is a building material necessary for the hard tissues, bones and teeth. Iron, on the other hand, is necessary for the production of red blood cells, and again, during the growth spurt, the increase in quantity of blood necessitates adequate iron intake or anemia results. The milligrams of calcium ingested in the 24 hour period ranged from the lowest quartile values of 702 mg. to the highest quartile intakes of 1613 mg. with a mean intake of 1234 mg. The mean intake of iron was 12.7 mg., with the lowest and the highest quartile values of 8 and 16 mgs., respectively. Again, the mean intakes for these minerals were quite comparable with those found in the interregional study, where the mean intake of calcium for 16-year olds was 1145 mgs. daily and the mean intake of iron was 13 mg.[2]

Vitamins

The intake of five vitamins was assessed in this study: Vitamin A, thiamin, riboflavin, niacin, and ascorbic acid. Vitamin A is known to be necessary for proper vision, for

[2] *Ibid.*, p. 33.

normal growth, and for health of the epitheleal tissue. The mean intake of vitamin A was 4962 International Units in the 24 hour period. The comparable figure in the interregional study was 6500 I.U.'s.[3]

The B vitamins thiamin, riboflavin, and niacin are all involved in energy metabolism and hence are again important during the adolescent period of rapid growth due to the large energy expenditure during this time. The mean thiamin intake for the 24 hour period was 1.4 mg. The mean riboflavin intake was 2.3 mg. and the mean niacin intake 16.3 mg. Comparable figures in the interregional study were 1.4 mg. for thiamin and 2.3 mg. for riboflavin. The figures presented for niacin are not comparable because of the differing methods used for calculation.[4] The role of ascorbic acid, or vitamin C in the body is not clearly understood. It is known, however, to be absolutely essential to the health of man. The mean intake of ascorbic acid for this group was 85 mg. for the 24 hour period. In the interregional study, the mean figure for 16-year old boys and girls was 79 mg.[5]

The nutritional implications of these nutrient intakes will be discussed in the next chapter. Table 5 presents the mean intake of all these nutrients, plus lowest and highest quartile values for the entire survey population.

---

[3]<u>Ibid</u>., p. 35. [4]<u>Ibid</u>., p. 35, 37. [5]<u>Ibid</u>., p. 37.

TABLE 5

Total Nutrients Consumed

	Mean	Lowest Quartile	Highest Quartile
Carbohydrate-grams	292	188	367
Fat-grams	116	72	152
Protein-grams	91	60	115
Kilocalories	2538	1655	3244
Calcium-mgs.	1234	702	1613
Iron-mgs.	13	8	16
Vitamin A-I.U.'s	4962	1870	5563
Thiamin-mgs.	1.4	.8	1.8
Riboflavin-mgs.	2.3	1.3	2.9
Niacin-mgs.	16.3	9.6	20.7
Ascorbic acid-mgs.	84.8	27.4	120.8

Types of Food Eaten

One of the advantages of using the system devised by the Consumer and Food Economics Research Division of the United States Department of Agriculture was that as the nutrient value of a food was being determined, that same food was being classified by type. Therefore, it was possible to determine the number of servings any subject or group of subjects consumed of the various classifications of food. The main classes into which the foods were subdivided were: Milk and Milk Products, Meat, Poultry, Fish, Eggs, Dry Legumes, and Nuts (hereafter referred to as Protein Foods) Vegetables, Fruits, Grain Products, Fats and Oils, and Sugars and Sweets. Each one of these major categories was further subdivided, so the number of servings of eggs, or fresh whole milk for example, could be determined. These results are tabulated in Table 6 (pp. 84-85).

The units of measure used in this study were the same as those in House and Garden Bulletin No. 72,[6] and were standard household units in most cases, such as cups, and tablespoons, or one medium potato or apple. When the researcher added a food not in the original Bulletin, the units were kept consistent. Thus, these foods are reported as consumed in numbers of servings.

---

[6] Nutritive Value of Foods, Home and Garden Bulletin No. 72, United States Department of Agriculture, Washington, D.C., 1960.

Milk and Milk Products

The products included in the milk group are cow's milk in all forms, cream, cheese, milk beverages, milk desserts, ice cream and yoghurt. Diet milk drinks such as Sego and Instant Breakfast were also included in this group.

The mean number of servings of all milk products for the subjects in this study in the 24 hour period was 3.7. For Milk and Milk Drinks, where the serving size was 1 cup, the mean number of servings was 2.7. For Cream, Ice Cream, and Milk Desserts, the mean number of servings was 0.7, while for Cheese, it was 0.24 servings. These results are presented in Table 6, p. 84.

Subdividing this food group further, the mean intake of fresh fluid milk was 2.5 cups per subject, plus a mean intake of 0.14 cups of milk drinks. The mean intake of frozen desserts, ice cream or ice milk was 0.6 servings per subject.

Simple correlations were done for certain divisions of the Milk Products Group to see if there appeared to be any relationship between the intake of food items in this group and any of the socio-economic variables noted. The results are presented in the Appendix, Table B1 (p. 267). It can be seen that for the entire Milk Products Group, there is a correlation, significant at the 1% level, between number of servings in this group and both sex and level of father's education.

In the instance of sex, the relationship was negative, and from the way in which the original coding for sex was done, this would indicate a negative relationship between female subjects and milk consumption. This would tend to support those workers who found the teenage girl to be more poorly nourished than the teenage boy. In the case of father's level of education, the relationship here was positive, indicating a higher milk consumption in those families where the father had more years of education. These same relationships are shown in the Milk and Milk Drink Group and in the Fresh Fluid Milk Group.

Also for the overall group of Milk Products, several other variables were significant at the 5% level. These are also presented in Table B1 (p. 267). A negative correlation with age indicates that as the child becomes older, he consumes less in this food group. There was also a negative correlation with color, and again, based on the form in which the original codes were set up, this would indicate that nonwhite subjects drank less milk than white subjects. This same result has been found in other research, and that there might be a physiological basis for the black child's avoidance of milk is suggested by recent research.[7] There was also a negative correlation between consumption of all milk products and those subjects who had not had pneumonia in the past five years. This might suggest that the child who had been ill with pneumonia was encouraged to consume protective foods such as milk.

---

[7]Anon. Lactose Intolerance, Dairy Council Digest 42:31, 1971.

Also in the total Milk Products Group, there was a positive correlation between milk consumption, and the father being classified as a professional worker. On the other hand, there was a negative correlation between consumption of products in this group, and the father being classified as an operative. This would, perhaps be associated with the father's level of education, and would reinforce the assertion that the more years of schooling the father had, the more milk his teenage child consumed.

Protein Foods

Included in this group are meats, fish, poultry, eggs, legumes, and nuts. In terms of the overall group, the mean number of servings per subject in the 24 hour period was 2.6. This, however, was further subdivided to give a clearer picture of what kinds of protein foods went into the total consumption. There was, for example, 1.7 servings of meat, fish or poultry for each subject, but only 0.2 servings of egg, or only about 1/5 of one egg per subject per day. Legumes accounted for only 0.05 servings in this group, while nuts, including peanut butter accounted for 0.2 servings. Protein mixtures, such as a tuna and noodles casserole, provided 0.3 servings per subject. These results are presented in tabular form in Table 6 (pp. 84-85).

Obviously the main contribution in this group came from meat, fish, and poultry. Looking at this group more closely, there was a mean number of servings for beef of 0.6, for pork of 0.5, of veal and lamb of 0.01, of liver

0.01, and of luncheon meat 0.3. Poultry accounted for 0.2 servings and fish 0.1 serving.

Simple correlations obtained for the Protein Foods Group with socio-economic variables obtained in the study indicate that some interesting relationships may exist. These correlation coefficients are shown in Table B1, p. 267. Significant at the 1% level were sex, level of father's education, and number of moves the family had made in the five years previous to the study. For sex, again the correlation was negative, indicating that girls in the study consumed less food in this group than did boys. Also, as with the Milk Products Group, there was a positive correlation between the level of the father's education and number of servings of protein foods, indicating a higher consumption by subjects in those families where the father had more years of education. Also positively correlated was the number of moves, showing a greater use of these foods by subjects whose families had moved more frequently in the five years previous to the study.

Color of the subject was significant at the 5% level indicating a higher consumption of protein foods by nonwhite than by white subjects. This would be beneficial especially as their milk intake was lower, as was shown previously. In the Meat, Fish, and Poultry Group, excluding other protein foods, the relationships were similar. However, also significant at the 5% level was the number of hours worked per week by the subject. The correlation was positive indicating the more hours worked, the more foods in this category there were consumed. This suggests that if adolescents earn money, they tend to spend some of it on protein foods. Also positively significant at the 5% level in this group were the father's occupation in a managerial position and the father's origin outside the North Central region of the United States. Again this might indicate that the more years of education the father had, or the higher his income bracket, as would ordinarily be the case in a managerial position, the more protein foods the child could consume. In the case of the father's origin, this suggests influences from eating patterns derived earlier by the father before his move to Michigan.

Vegetables

All vegetables, fresh, frozen, canned, or dried, and vegetable juices are included in this group. The mean number of servings of vegetables was 2.3 per subject. For almost all vegetables, the unit of measure was a cup. A great part of this Vegetable Group was consumed as potatoes with 1.3 servings as the mean intake. On the other hand dark green and deep yellow vegetables rated very low with a mean intake of 0.1 serving per subject, as did the tomato group, also with 0.1 serving. Other vegetables accounted for 0.7 servings, and vegetable mixtures such as coleslaw only 0.1 serving. These results are presented in Table 6 (p. 84).

Simple correlations obtained between consumption of the entire Vegetable Group and socio-economic variables obtained in this study indicate three items significant at the 1% level. These are shown in Table B1 (p. 267). The items were sex and color of the subject, and hours per week that the subject worked. Again, the correlations showed a negative correlation between vegetable consumption and the female sex, and a positive correlation between vegetable consumption and the nonwhite subjects. The correlation between hours of work per week and vegetable consumption was also positive indicating again, perhaps the spending of money for foods in this group--probably french fried potatoes at a drive-in.

Looking at the subgroups within the vegetable category, the consumption of potatoes showed exactly the same correlations significant at the 1% level as did the entire Vegetable Group. Also significant at the 1% level was a positive correlation between potato consumption and the father's occupation as an operative. Potato consumption would seem to be related, then, to several socio-economic variables: Sex, color, subject's earning power, and the father's occupation. This last item might well be economic, as potatoes are a less expensive food, or it might reflect the father's eating patterns based on his own upbringing.

The other subgroups within the Vegetable Group did not account for as much of the vegetable consumption. However, it is interesting to note that in the classification including other vegetables (excluding potatoes, tomatoes, and dark green and deep yellow vegetables) there was significant correlation at the 1% level with sex, illness from bronchitis with the past five years, father's level of education and the father's occupation as a professional. For sex, the correlation again is negative with respect to female subjects indicating once more that they consumed less of this food group than did the males. For father's level of education and father's occupation as a professional, the correlation is positive, indicating a greater consumption of vegetables in this group when the father of the family fell into this occupational class, and had more years of education. The correlation for subjects having had bronchitis was negative, thereby indicating a lower consumption by those who had not had bronchitis. Again, previous illness might well influence eating habits in terms of trying to prevent a recurrence. It should be mentioned that the number of subjects who had had bronchitis was small. Positively significant at the 5% level was consumption of vegetables in this group when correlated with the father's occupation as manager. This, again, might well be related to the father's level of education, as those in the professional and managerial classes would be expected in general to have the most years of education.

Fruits

The Fruit Group includes all fruit and fruit products whether they are fresh, frozen, canned, dried, or juiced. Again, for the most part, the unit of measure per serving was one cup. For the entire Fruit Group, the mean number of servings for each subject was 1.0. Three subgroups of fruit were also examined--Citrus Fruits, Dried Fruits, and Other Fruits. The mean number of servings of citrus fruits was 0.5 for each subject, and for other fruits, also 0.5.

Dried fruits made almost no contribution to fruit intake at all. These results are given in Table 6 (pp. 84-85).

Simple correlations obtained between the entire Fruit Group and socio-economic variables obtained from this study indicate several significant correlations at both the 1% and the 5% level. These correlations are presented in Table B1 (p. 267). Positive correlations at the 1% level existed between consumption of fruit and the level of the father's education, the mother's age, the father's occupation in the professional category, and the family belonging to a Protestant religion. Negative correlations existed between the mother's hours of work outside the home per week, the number of siblings living at home, and the subjects who had not had mononucleosis within the past five years. At the 5% level, there were positive correlations between fruit consumption and grade in school of subject, and also the father's occupation in the managerial category. On the other hand, negative correlations existed between fruit consumption and the father's occupation as either a craftsman, operative, or service man.

As can be seen by consulting Table B1 (p. 267) most of these correlations carry through for the Citrus Fruit Group, and the Other Fruit Group.

Several socio-economic factors seem to be related, then, to the consumption of fruit by the teenager. There is a positive relationship between the years of education of the father and the amount of fruit consumed. This would carry over to the father being employed as a professional or a manager. Fathers with presumably less education, craftsmen, operatives, and servicemen, headed families where the teenager consumed less fruit. The intake of fruit by the subjects was also positively related to the mother's age, thus indicating that the subjects with older mothers tended to consume more fruit. The more hours the mother worked outside the home per week, the less fruit there was that was consumed by the teenage subjects. This might indicate a choice of snack foods other than fruit, for example, if the mother were not home as much. Also, the more brothers and sisters the subject had living at home, the less fruit he ate, possibly indicating that fruit, which tends to be expensive, was served less often when the family was larger. Subjects who had had mononucleosis appeared to be eating more fruit, perhaps again as a protective food, than did other subjects.

Religion is an interesting factor because there seems to be a relationship between it and the subject's consumption of and attitude towards several kinds of foods. In most cases it has nothing to do with the rules of the religion specifically prohibiting or insisting on the eating of a particular food. On the other hand, the fact that it turns up frequently as a significant factor would indicate that there is some underlying factor in the religion, not immediately apparent, that has influenced the way the family and the subject eats. It might be ethnic--certain food patterns were certainly carried to this country by the Irish Roman Catholics or the German Jews--or it might be economic, or a variety of other things. In this case, subjects whose family adhered to a Protestant faith, consumed more fruit than did other subjects.

<u>Grain Products</u>

The Grain Products Group includes cooked and dry cereals, breads and rolls, cakes, cookies, crackers, pastries, pastas, and all other products prepared mainly from grains. These kinds of foods have different units of measurements, with a serving of bread being equal to one slice, and a serving of cereal or pasta one cup. The mean number of servings per subject for the 24 hour period of the study was 6.8, thus indicating a fairly high intake of grain products. Subgroups under the Grain Products Group included Whole Grain or Enriched Grain Products, Unenriched Grain Products, and Grain Mixtures. The last group would include such items as apple pie, or spaghetti with tomato sauce and cheese. More foods of the whole grain and enriched type were consumed, with a mean intake per subject of 3.8 servings. Unenriched products accounted for 2.3 servings, and grain mixtures 0.7 servings. These results are presented in Table 6 (pp. 84-85).

Further subdivision of this group was also carried out. The Whole or Enriched Grain Products were divided into Flour, Cereal, and Pastes, Bread and Rolls, and Other Baked Goods. Mean number of servings for each of these classes per subject for the 24 hour period was 0.5, 3.1, and 0.3 indicating that the great majority of foods consumed in this group was in the form of bread and rolls. For the Unenriched

Grain Products, Cereals and Pastes accounted for 0.2 servings, Bread and Rolls for 0.1 serving and Other Baked Products for 2.1 servings, indicating a fairly large consumption in this last group. This would include items such as doughnuts, crackers, commercially made cupcakes and cookies. If these can be considered snack foods, a fairly high consumption per subject is evident.

The simple correlations between consumption of foods in the Grain Products Group and the socio-economic factors elicited from the study are shown in Table B1 (p. 267). Significant at the 1% level are three negative correlations: Age, sex, and father's occupation as a service employee. Therefore, as the age of the subjects increased, the amount of grain products they consumed decreased. Again, the manner of coding indicated the sex relationship was negative for girls, thus indicating that girls consumed less grain products than did boys. Finally, if the father of the family was employed as a service employee, less grain products were consumed. Two correlations were significant at the 5% level, and these were both positive. If the father's occupation was that of a farm laborer, more grain products were consumed by the subject. Also, if the origin of the mother of the family was outside of the North Central states, the consumption of grain products was higher by the subject.

These same significant correlations tend to reappear in the subgroups under grain products, as can easily be seen by consulting Table B1 (p. 267). Other correlations which appear that are significant include number of illnesses when correlated with the intake of whole grain and enriched cereals. Here the correlation is a negative one indicating that as the consumption of whole grain and enriched cereals increased, the number of illnesses per subject decreased.

For the subgroup entitled Unenriched Grain Products, Other Baked Products, which would include such snack foods as cake, cookies, crackers, and so on, there are three different significant correlations at the 5% level, all of them positive. One of them is color, and from the manner in which the subjects were coded, this indicates that the nonwhite subjects consumed more items in this group than did the white subjects. Also positively correlated was the level of the father's education, so that as the years of education of the father in the family increased, so did the subjects intake of foods in this group. Finally, there was a positive correlation between consumption of these baked products and the religion of the subject being Protestant.

Several socio-economic factors, then, appear to have influenced the teenagers consumption of grain products. The father's occupation was related to increased grain product consumption if he were a farm laborer, but was related to lower grain product consumption if he were a service employee. The more years of education the father had influenced the teenager in terms of consuming more foods of the cake, cookies and cracker variety. This could possibly be related to increased availability of these items in families with larger incomes. The mother's origin was related to grain product consumption, for if she came from an area outside of North Central United States, the teenager tended to consume more of these products. This could well be a reflection of the mother's own food habits that she brought with her to Michigan. In the case of the subjects themselves, girls consumed less in the grain products group than did boys, as they did in every major food group. Non-white subjects also consumed more nonenriched baked goods than did white subjects, suggesting a greater reliance of black teenagers on this type of snack food. There was a relationship between the subject's having fewer illnesses and consuming more items in the whole grain and enriched cereal group. Again, this might indicate a desire on the part of the child or his family to consume more protective foods if severe illness had been a recent problem. Or it might indicate a positive effect in terms of good nutrition in the ability to avoid these illnesses.

Fats and Oils

The Fats and Oils Group contains butter and margarine, cooking fats, gravy, and salad dressings. The unit of measure here was one tablespoon. The mean number of servings consumed by the subjects in the study for a 24 hour period was 2.1, as is shown in Table 6 (p. 84). No effort was made to further subdivide this group.

Simple correlations between the consumption of fats and oils and the socio-economic variables collected in this study indicated a negative correlation, significant at the

1% level, between fat and oil intake and the female sex, indicating that again, girls ate less of this type of food than did boys. Also significant at the 1% level was a positive correlation between hours of work the subject worked outside of school and consumption of foods in this group. This might well indicate that the money earned was spent for foods included in this group. These correlations are shown in Table B1 (p. 267).

There was also a correlation significant at the 5% level for color of the subject, indicating a negative relationship between nonwhite subjects and consumption of fats and oils. In other words, black teenagers in this study ate less fats and oils than did white teenagers. This was the same relationship that existed with milk consumption.

Sugars and Sweets

The Sugars and Sweets Group includes sugars, sirups, candies and jams and jellies, as well as carbonated beverages and plain gelatin desserts. Those gelatin desserts and salads with fruit or vegetables added would have been included in either the Fruit Group or the Vegetable Group. The units of measure here varied with the products. For the sugars, sirups, jams, and jellies it was one tablespoon. For the candy, one ounce was used. One cup was the unit of measure for the carbonated beverages and the gelatin desserts. The mean intake of foods in this group was 2.4 servings per subject for the 24 hour period involved. To subdivide this, there was 1.3 servings of sugars, sirups, honey, and/or candy, and 1.1 servings of soft drinks and/or gelatin desserts. Because there is so much concern about teenagers consuming large quantities of foods in these groups, further subdivision was carried out. Sugars accounted for 0.3 servings, sirups and honey for 0.2 servings, jellies and jams for 0.2 servings, candies for 0.5 servings, carbonated soft drinks for 1.0 servings, and gelatin desserts for 0.1 serving. Clearly the largest consumption in this last subdivision comes from carbonated soft drinks. These results are presented in Table 6 (p. 84). It should be mentioned here that when a subject listed a carbonated beverage of the sugar-free type such as Tab or Fresca, this was not included.

The simple correlations between consumption of sugars and sweets by the subjects in the study, and the socio-economic variables tabulated are given in Table B1 (p. 267). For the entire Sugars and Sweets Group, there were three correlations significant at the 1% level. These indicate a negative relationship between the female sex and sugar consumption, again showing that girls consumed less in this food group than did boys. A positive relationship existed between nonwhite subjects and sugar consumption, indicating that the black subjects in the study consumed more sugars and sweets than did whites. It has been shown that the black subjects drank less milk than did the whites, but they clearly consumed more soft drinks and beverages such as Kool-Aid which are high in sugar. There is also a positive correlation between number of hours the student worked outside of school and his intake of foods in this group, again perhaps indicating the disposition of some of his additional income. Significant at the 5% level was the positive correlation between consumption of sugars and sweets, and the origin of the subject's mother outside of North Central United States. In other words, these subjects consumed more sugars and sweets again suggesting a different eating pattern brought to Michigan by the mother from elsewhere.

These same relationships carry through in many instances for the subgroupings under the Sugar and Sweets Group, as can be seen by consulting Table B1 (p. 267). For the Sugar, Sirups, and Candy Group there is a positive correlation between consumption of these items by the subject and number of brothers and sisters living at home. This would indicate that more of these things were available in families covered by this survey with more children. For the Soft Drink and Gelatin Dessert Group, there are two correlations significant at the 1% level relating to the occupation of the father of the subject. If the father is employed in a professional occupation, there is a negative relationship for intake of foods in this category, but if the father is employed in sales, there is a positive relationship. These same relationships carry over into the category containing only carbonated soft drinks, but with an additional positive correlation at the 5% level if the subject's father is employed as an operative. There is a positive correlation, significant at the 1% level, between the consumption of candy by the subject and the father's occupation as a professional man. These relationships suggest that the father's occupation might influence the life style of the family, and where in a professional family, the consumption of soft drinks might be considered "bad" or "harmful," in a sales or operative family they might be considered "good" or "acceptable" at least from the social point of view. Candy, on the other hand, seemed to be consumed more by children of professional fathers.

TABLE 6

Number of Servings of the Various Foods
Consumed by Surveyed Subjects

	Mean	Median	Lowest Quartile	Highest Quartile	Range
Milk and Milk Products	3.7	3.1	1.9	4.9	0.0-19.0
Milk and Milk Drinks	2.7	2.5	1.0	3.8	0.0-16.0
Fresh Fluid Milk	2.5	2.2	1.1	3.6	0.0-16.0
Milk Drinks	0.1	0.0	0.0	0.2	0.0- 4.5
Cream, Ice Cream, Milk Desserts	0.7	0.4	0.0	1.0	0.0-10.0
Frozen Desserts	0.6	0.3	0.0	1.0	0.0-10.0
Cheese	0.2	0.2	0.1	0.3	0.0-10.0
Protein Foods	2.6	2.1	1.0	3.5	0.0-13.0
Meat, Poultry, Fish	1.7	1.4	0.6	2.4	0.0-10.6
Beef	0.6	0.1	0.0	1.0	0.0- 6.3
Pork	0.5	0.1	0.0	0.7	0.0- 9.0
Veal, Lamb	0.0	0.0	0.0	0.0	0.0- 3.0
Liver	0.0	0.0	0.0	0.0	0.0- 4.0
Game and Luncheon Meat	0.3	0.0	0.0	0.6	0.0- 7.0
Poultry	0.2	0.0	0.0	0.4	0.0- 8.0
Fish	0.1	0.0	0.0	0.2	0.0- 3.0
Eggs	0.2	0.2	0.1	0.3	0.0- 9.0
Legumes	0.1	0.0	0.0	0.2	0.0- 4.0
Nuts	0.2	0.1	0.0	0.4	0.0-12.0
Protein Mixtures	0.3	0.2	0.0	0.6	0.0- 8.0
Vegetables	2.3	1.8	0.9	3.0	0.0-16.2
Potatoes	1.2	1.0	0.1	1.8	0.0-13.5
Dark Green, Deep Yellow Vegetables	0.1	0.0	0.0	0.2	0.0- 5.0
Tomatoes	0.1	0.0	0.0	0.2	0.0- 4.0
Other Vegetables	0.7	0.3	0.1	1.0	0.0-10.0
Vegetable Mixtures	0.1	0.0	0.0	0.2	0.0- 3.0

TABLE 6--Continued

	Mean	Median	Lowest Quartile	Highest Quartile	Range
Fruits	1.0	0.6	0.0	1.5	0.0-10.3
Citrus Fruits	0.5	0.4	0.1	0.8	0.0-10.2
Dried Fruits	0.0	0.0	0.0	0.0	0.0- 1.0
Other Fruits	0.6	0.3	0.1	1.0	0.0- 9.8
Grain Products	6.8	6.0	3.5	9.0	0.0-32.5
Whole-grain or Enriched	3.8	3.1	1.7	5.2	0.0-23.4
Pastes & Cereals	0.5	0.0	0.0	0.7	0.0- 8.0
Bread	3.0	2.6	1.0	4.1	0.0-15.2
Other Baked Goods	0.3	0.1	0.0	0.5	0.0-19.0
Non-enriched	2.3	1.4	0.1	3.2	0.0-23.5
Pastes & Cereals	0.2	0.1	0.0	0.4	0.0- 6.0
Breads	0.1	0.0	0.0	0.2	0.0- 8.0
Other Baked Goods	2.1	1.1	0.1	3.1	0.0-23.5
Grain Mixtures	0.7	0.2	0.0	1.0	0.0-12.0
Fats and Oils	2.0	1.0	0.1	2.5	0.0-32.0
Sugars and Sweets	2.4	1.7	0.2	3.5	0.0-34.5
Sugars, Sirups, Candies	1.3	0.4	0.1	2.0	0.0-33.0
Sugar	0.3	0.0	0.0	0.6	0.0- 7.5
Sirups and Honey	0.2	0.0	0.0	0.4	0.0-32.0
Jellies and Jams	0.2	0.0	0.0	0.4	0.0- 5.3
Candies	0.5	0.1	0.0	1.0	0.0-12.0
Soft Drinks and Dessert Powders	1.1	0.9	0.1	2.0	0.0- 9.8
Soft Drinks	1.0	0.1	0.1	1.5	0.0- 9.8
Ices, Popsicles, Gelatin	0.1	0.0	0.0	0.2	0.0- 8.0

Meals and Snacks - Protein and Calories Consumed

One of the concerns voiced most frequently about teenage food habits deals with their supposedly large consumption of snack foods containing "empty calories." The assumption is that these foods provide only energy and are deficient in protein, vitamin, and mineral content. Therefore, if a child consumes large quantities of this type of snack food, he may be meeting his energy requirements without meeting his other nutrient requirements. One indication of this was suggested in the previous section, where the mean intake of unenriched baked products was 2.3 servings per subject for the 24 hour period involved in the study. While these kinds of foods are not pure carbohydrate and fat, they are low in other nutrients.

A more comprehensive way of studying the effect of snack foods on the nutrient intake of teenagers was to examine the foods they ate as snack foods as well as the foods they consumed at meals. This was done by noting on the original questionnaire whether each food item consumed was eaten as a snack, or part of a meal. The subject was asked to make this designation himself. It was then determined what percentage of his calories and his protein came from meals and from snacks.

The results of this study showed that in terms of the total kilocalories consumed by all subjects, the mean percentage caloric intake at meals was 80% and the mean percentage intake from snacks was 20%. On the other hand, of all the protein consumed by the subjects, the mean percentage intake at meals was somewhat higher at 88%, with only 12% of the protein coming from snacks. This would certainly indicate that the type of food chosen for snacks made a greater contribution to caloric intake than to protein intake. These results are presented in Table 7 (p. 94).

Simple correlations were determined between the percentages of calories and protein obtained from meals and from snacks, and the socio-economic variables obtained in the study, and are presented in the Appendix Table B2 (p. 281). There was a positive correlation, significant at the 1% level, between the grade in which the subject was in school, and the percent of calories obtained from meals. This might indicate greater family control over the subject's food consumption patterns at the earliest grade (tenth in this study) and a lessening of control in the later grades. Significant at the 5% level was a positive correlation with age, which can be assumed to be directly related to the student's grade. Negative correlations, significant at the 5% level, were found between the percent of total calories consumed at meals and the nonwhite subjects, and also when the father's occupation was a salesman or a farm laborer. This would indicate fewer calories consumed at meals for these groups. In other words, snacking contributed more to the caloric intake of black subjects than of the white subjects. Also when the subject's father was a salesman or farm laborer, more calories were derived from snacking by these subjects than for other groups, indicating different eating patterns.

Two correlations were significant at the 5% level between the percentage of protein consumed at meals and socio-economic variables. In these instances, there was a negative correlation with the nonwhite subjects, and also a negative correlation with the hours worked per week by the subject outside of school. For the former group, this would indicate that black teenagers consumed less of their total protein at meals than did the white teenagers, but, conversely received a greater percentage of their protein from snacks. For the latter group, this might well indicate irregular meal hours, or possibly no meal at all, and a greater reliance on snacking due to their employment.

With Whom Did the Subject Eat?

Another aspect of food consumption patterns, or food habits, centers on the companionship a person has while eating. It has been suggested that children, including teenagers, when eating by themselves tend to choose foods high in energy value but low in other nutrients. On the other hand, it is suggested that the family has a positive effect on children consuming foods high in nutritive value when some or all of the family eat together. Donald E. Allen, *et al.*, have presented evidence to indicate that this is strongly related to a teenager's development and maturation.[8] Another

---

[8]Donald E. Allen *et al.*, Nutrition, family commensality, and academic performance among high school youth. J. Home Ec. 62:333, 1970.

possibility is, of course, that the child eats with friends, either at school or snacking after school. In some instances, the teenagers in this study ate with friends at a drive-in or other type of restaurant.

When examining the total caloric intake of the subjects for the 24 hour period involved in the study, the mean percentage intake of calories consumed alone was 23.2%, or roughly one-quarter of their total energy intake. A slightly lower figure for protein consumption was found--the mean intake of protein was 20.5% of the total amount eaten alone. In terms of calories consumed with the family, the mean percentage of total calories consumed with all of the family eating together was 27.6%, while 16.5% was the figure computed for the family eating together with at least one family member absent. When the entire family ate together, the mean percentage intake of total protein consumed for the 24 hour period involved was 32.1%, while it was 17.4% for some of the family eating together. The consumption of food with friends accounted for a mean percentage intake of calories of 32.5%, and a mean percentage intake of protein of 29.9%.

These figures shown in Table 7 would indicate, then, that in the case of this study, when the subjects ate alone or with friends, the foods tended to be slightly higher in caloric value than in protein value, while when eating with their families, the opposite was true. The differences tend to be rather small, however.

Simple correlations were determined between the companionship of the subjects when they consumed food, and the socio-economic factors determined in the present study. When examining the percentage of calories consumed in various situations, only two socio-economic factors are significant at the 1% level. There was a negative correlation between hours worked outside school by the subject and the percentage of calories eaten with the entire family. Conversely, there was a positive correlation between percentage of total calories consumed for this group eaten with friends. These relationships indicate less reliance on the family for eating companionship when the teenager works outside the home. Also showing a positive relationship was the percentage of calories eaten with friends and the nonwhite subjects in the study. The same relationships show up when looking at the percentage of the total protein intake eaten with various groups. Thus, the black subjects tended to eat more with friends and less with their families than did the white subjects. These correlations are given in Table B2 (p. 281).

Where Did the Subject Eat?

For the most part, these subjects consumed most of the food they ate in one of two places: home or school. Whereas there was a hot school lunch program provided in every one of the schools included in the study, the student actually had several choices open to him for the noon meal. He could eat all or part of the school lunch provided, he could eat a lunch he brought from home, he could secure items out of vending machines (milk, soft drinks, candy, ice cream), or he could eat nothing at all. Many students chose the last plan.

As might be expected with teenagers still living at home, the percentage of total calories consumed at home was fairly high, with a mean of 65.5%. The mean percentage of calories consumed at school was 24.5% with the mean percentage of calories eaten elsewhere 9.8%. The mean figures for percentage of total protein consumed tended to be quite similar, with 68.3% at home, 23.4% at school, and 8.1% elsewhere. Table 7 presents these results.

Simple correlations were carried out between the percentages of calories and of protein eaten by the subjects in the different locations, and the socio-economic factors determined by the study. A negative correlation, significant at the 1% level, occurred between the percentage of calories consumed at home and the hours the subject worked per week outside of school. A similar positive correlation occurred for percentage of total calories eaten away from school and home (elsewhere). Again, this tends to be self-explanatory. Also, there was a correlation, significant at the 1% level between the percentage of calories eaten at home and those subjects who had not had rheumatic fever in the past five years. This showed up at the 5% level with a negative correlation between percentage of total calories eaten at home and the number of illnesses the subject had had in the five years previous to the interview. There was also a correlation, significant at the 5% level between those subjects who had not had pneumonia and the percentage of calories eaten at home. Thus, relationships seem to have existed between the subject's eating patterns and the number of recent illnesses that he had contracted. As the percentage of calories eaten at home decreased, the number of illnesses increased. Thus, subjects who ate away from home more might not have had the nutritional guidance of the family and hence might be more prone to illness. This agrees also with the correlations for rheumatic fever and pneumonia victims, as they ate less at home and more elsewhere than did those who had not contracted these illnesses within the five years previous to the survey.

Negative correlations also appeared at this level between the age and the grade of the student, and the percentage of calories consumed at home. Thus, the older subjects ate at home less than the younger subjects, which might be expected as the teenager became more independent. For the percentage of calories eaten elsewhere (not at home or at school), correlations in agreement with the above information can also be seen. One additional correlation, significant at the 1% level, is between the percentage of calories eaten elsewhere and the occupation of the father in the family as a salesman. This, again, might be indicative of the lifestyle developed in a family where the father was a salesman and often ate away from home.

When examining the correlations between percentages of protein consumed by the subjects in various places, and socio-economic factors, many of them are the same as for calories. One exception should be noted, however. There was a negative correlation, significant at the 5% level between the percentage of protein consumed at home and the father's occupation in a service profession. The service professions include such diverse jobs as policemen, guards, watchmen, waiters, barbers, janitors, and elevator operators. Apparently, at least for the paternal group of service workers represented in this study, some underlying common factor was related to their teenage children consuming more protein away from home than for others in the study.

TABLE 7

Mean Percentage of Total Calories and Protein Consumed by Subjects Surveyed

	Calories	Protein
At Meals	80.0	88.0
At Snacks	20.0	12.0
Alone	23.2	20.5
With the Entire Family	27.6	32.1
With Some of the Family	16.5	17.4
With Friends	32.5	29.9
At Home	65.5	68.3
At School	24.5	23.4
Elsewhere	9.8	8.1

Who Purchases Food for the Family?

The person who purchases food for the family usually has an important effect in determining at least in part, the food habits of the teenager. What foods are available to be prepared for meals and what foods are available for snacks at home depend on what is brought home from the grocery store. Each subject interviewed was asked to indicate who was the major food purchaser in the family. From the variety of answers that were given, nine categories were established as shown in Table 8. Therefore, each student gave a "yes" answer for one category, and "no" for all of the rest. Of the nine categories, only four accounted for a yes answer from more than 1% of the total survey group. The mother was the major food purchaser in 76% of the subjects' families, the mother and father together accounted for 10%, the father alone 7%, and the mother and the subject, 3%.

Simple correlations were done between the percentage of major food purchasers in each category and the socio-economic factors determined in the study. In the largest category, Mother, there were two correlations, significant at the 1% level, both dealing with the father in the family. There was a positive correlation in relation to the number of years of the father's education, thus indicating that the more education the father of the family had, the more the mother of the family was apt to be the major food purchaser. On the other hand, there was a negative relationship to the father's age indicating that the younger the father of the family was, the more the mother was apt to be the major food purchaser. When the major food purchasers were Mother and Subject, there was a positive correlation, significant at the 1% level between both the age and the grade of the subject, thus indicating more responsibility for some of the older students in terms of assisting their mother with purchasing food for the family. When the major food purchaser was Father, there was a positive correlation between a positive answer in this category and the Mother's hours of work per week outside the home, significant at the 1% level. This would indicate, then, some help in terms of the father of the family procuring the food when the mother was employed outside the home. These results are presented in the Appendix in Table B3 (p. 288).

Who Prepares Food for the Family?

Again, the person or persons mainly responsible for the food preparation in the family are often highly influential in determining the food habits of the adolescent. Each subject interviewed was also asked to indicate who was responsible for most of the food preparation in their family. These were subdivided into the same categories as used in the previous section on purchasing, and the results are given in Table 8. The Mother accounted here for 76% of the positive responses given, but the other replies were more varied. Mother and the Subject accounted for 8%, the Subject alone 5%, Mother, Subject, and Other Family Members, 3%, and Other, 4%. In this last category were included relatives other than those listed, and outside help.

Simple correlations were again carried out between the percentage of major food purchasers in each category and the socio-economic factors determined in the study. For the largest category, Mother, there were several correlations significant at the 1% level, and all negative. The percentage of subjects' families with the mother as the major food preparer showed a negative relationship with her hours of work outside the home per week, with the adolescent subject being female, with the father's occupation being that of a laborer, and with the mother herself having come from Michigan. This indicates that if the mother worked outside of the home, or if she had a daughter in the study, she was less likely to be solely responsible for the family's food preparation. Both of these factors contributed to either someone else doing or helping with the food preparation. Also, the mother was less likely to be entirely responsible for the food preparation if her husband's occupation was that of a laborer, or if she herself originally came from Michigan. Apparently, at least based on this study, Michigan mothers do less food preparation, at least by themselves, than do mothers from other areas of the United States.

The next highest category for food preparation was Mother and Subject. Here there were two positive correlations significant at the 1% level: the subject being female, and the father's occupation being a laborer. These bear out the relationships discussed above. In the third highest category for food preparation, the Subject alone, there were three correlations significant at the 1% level, and these all indicated positive relationships. They are the sex of the subject being female, the hours of work of the mother outside the home, and the number of illnesses in the past five years of the subject. Results are presented in Table B3 (p. 288). The first two relationships again bear out the factors discussed under the "Mother" category. The third relationship indicates that if the subject alone was the sole person responsible for the family's food preparation, he was more apt to have had at least one illness in the past five years.

TABLE 8

Major Food Purchaser and Major Food Preparer as Listed by Subjects Surveyed for Their Family

Category	Major Food Purchaser	Major Food Preparer
	%	%
Mother	76	76
Mother and Subject	03	08
Mother, Subject & Other Family Members	01	03
Mother and Father	10	01
Father	07	02
Subject	01	05
Subject & Others Except Mother	01	01
Grandmother	00	00
Other	01	04
	100	100

Attitudes Towards Various Foods

In an attempt to see if there were any differences in the type of foods liked and disliked by teenagers, twenty foods were chosen, and the subjects were asked to list a response to each of them. They could indicate on a numerical scale one of five degrees for each food from like very much (1) to dislike very much (5). In addition a sixth category was offered for those who were unfamiliar with that particular food. The results, stated in percentages of the total survey population indicating each response are given in Table 9. An overall view of this table would indicate certain generalizations. Certain foods were overwhelmingly liked by the great majority of the high school students in this study. These would include french fried potatoes, pizza, spaghetti, chocolate cake, pork chops and milk and cola beverages. Other foods, while liked by some, were disliked by a considerable number as well. Such foods would be chop suey, baked custard, and oatmeal. Some foods, including all the other vegetables and the fried calves' liver, were more disliked than liked. Perhaps the most interesting category though, is the one in which they indicated the food was unfamiliar to them. This might have occurred because the food was never served at home, or because the subject never had the inclination to try it. Lasagne, fried calves' liver, fried scallops, cauliflower, and baked custard were all foods unfamiliar to more than 10% of the students surveyed.

Simple correlations were done between the percentage of subjects checking each category for each food, and the socio-economic factors determined in this study. In the following discussion, those foods which showed a divergence of opinion by the subjects, and which showed significant correlations at the 1% level will be mentioned. Because food preferences are such a personal thing, it was often very difficult to offer an explanation for some of the relationships which showed significance. However, an attempt at explanation was made in many instances, though of course it is extremely subjective. These correlations are shown in the Appendix, Table B4, p. 295.

<u>French Fried Potatoes</u>

A total of 97% of the students involved in the study indicated that they liked French fried potatoes. Only 1% indicated that they disliked them even slightly, and less than 1% disliked them very much, or were unfamiliar with them.

<u>Lasagne</u>

Twenty-seven percent of the subjects indicated that their attitude towards lasagne was "like very much." There was a positive correlation between the female sex and choosing this category. Thus, girls liked lasagne better than boys did. Also showing a positive correlation was the number of years of education of the father, and the father's occupation as a manager. In other words, subjects whose fathers fell into these categories also liked lasagne better than did other groups. On the other hand, the father's occupation as an operative showed a negative correlation.

Thirty-eight percent of the subjects chose the sixth category under <u>Lasagne</u> indicating that they were unfamiliar with this food. Here there were negative correlations between this attitude and the grade in school of the subject, the female sex of the subject, the number of years of education of the father, and the father's occupation as a professional. There were also two positive correlations in this category: the subject being nonwhite and the father's occupation being an operative. Interestingly enough, few subjects checked the "dislike very much" category, thus indicating that most subjects who were familiar with this food did like it.

Lasagne might be described as the "most foreign" food on the list given to the subjects and it also was unknown to more subjects than any other food. This might be interpreted to mean that subjects with a knowledge of lasagne could be considered more sophisticated in terms of their attitude towards food. If this assumption is made, subjects whose fathers had more years of education, or were classified as professionals would be more sophisticated than subjects whose fathers fell into other groups. This would also be true of the girls in the study, and would be truer of subjects in the higher grades. On the other hand, lack of sophistication would be associated with the black subjects and those whose fathers were operatives.

Chili Con Carne

A total of 63% of the subjects checked categories one or two for this food indicating, therefore, that the majority of subjects liked it. There was a positive correlation between checking the category "Like very much," and the subject being nonwhite, as well as the number of moves made by the subject in the past five years. This would indicate the black subjects liked chili better than the white subjects, and also that the subjects in the more mobile families liked it more. Only 8% indicated that they disliked chili con carne very much, and another 8% indicated unfamiliarity with the food.

Chop Suey

Fifty percent of the students involved in the study indicated some liking for chop suey, while 21% checked the "Dislike very much" column. Only 8% indicated unfamiliarity with the food. There was a positive correlation between the category "Like very much" and the subject being female, and also with the occupation of the father being a manager. This parallels the reaction of these two groups to lasagne.

Fried Calves' Liver

Only 21% of the subjects indicated any liking for calves' liver, while 41% checked the "Dislike very much" category, and 24% indicated unfamiliarity with the food. There was a positive correlation between the hours worked per week outside school by the subject, and those who checked the category "Like very much." There was also a positive correlation between this group, and the number of brothers and sisters the subject had living at home with them, and also with the father's occupation being that of a laborer. Although calves' liver is certainly not an inexpensive form of food, other types of liver are, and there may have been a tendency for subjects to include all forms when thinking about this category. Economy could account for the exposure to and liking of liver by families with large numbers of children, and by subjects whose fathers were laborers. On the other hand, subjects who worked outside of school may simply have accepted more types of foods.

<u>Sauerkraut</u>

A total of 39% of the subjects involved in this study indicated that they liked sauerkraut either very much or slightly, while 34% indicated that they disliked it very much. Only 6% indicated unfamiliarity with the food.

<u>Pizza</u>

Pizza was another one of the foods almost universally liked by the students filling out the questionnaire for the study, as 91% checked categories one and two. No one indicated unfamiliarity with pizza. There was a negative correlation between the subject being nonwhite and checking the "Like very much" category, as well as a negative correlation with the father's occupation being a salesman. In other words, white subjects liked pizza better than black subjects, perhaps because of greater familiarity with the food. Subjects whose fathers were salesmen also apparently did not like pizza as well as other groups.

<u>Fried Scallops</u>

Fifty-five percent of the subjects indicated that they liked fried scallops, while 16% indicated that they disliked them, and another 16% indicated that they were unfamiliar with this food. There was a positive correlation between checking category two, "Like slightly" and the sex of the subject being female. Also positive was a correlation between choosing this category, and the religion of the subjects' family being described as mixed. This would indicate that those subjects from families whose members practiced different religions were more apt to have selected the "Like slightly" category than other subjects. In the case where the religion is described as mixed, as it is here, it becomes very difficult to assess its implication. It would, of course, depend on the particular mixture involved.

For those who checked the category indicating unfamiliarity with the food, there was a positive correlation with the father's occupation being a farmer, and also with the sex of the subject being female. Farmers, perhaps rely more on what they grow and less on imported items such as fish. There was a negative correlation between choosing this category, and the number of years of education of the subject's father. Scallops tend to be an expensive food, and years of education in this case might be equated with higher income, or greater knowledge of food, or both. In any case there were fewer subjects of this type who were unfamiliar with scallops.

Cooked Spinach

Only 35% of the subjects involved in the study indicated any liking for cooked spinach, while 37% checked the category showing that they disliked it very much. Only 3% indicated that they were unfamiliar with spinach, thus suggesting exposure to this vegetable but not conversion to enjoying it. There was a positive correlation between choosing the category "Like very much" and the subject's mother originally coming from outside the North Central area of the United States. This would indicate the mother's bringing food habits of liking and serving spinach from elsewhere to Michigan.

There were also negative correlations between the subject choosing the category labeled "Dislike very much," and both the father and mother of the subject being originally from outside the North Central region of the United States, and this would agree with the relationship mentioned above. There was also a negative correlation between the religion of the subject and his family being Protestant and the subject's indicating that he disliked spinach very much. In other words, Protestant subjects seemed to like spinach more than other groups, although the reason for this is not clear.

Pancakes

Pancakes were liked by 81% of the subjects, while only 5% said they disliked them very much. Less than 1% were unfamiliar with pancakes. There was a negative correlation between choosing the category "Like very much" and the subject's being female. In other words, girls liked pancakes less than boys. There was also a negative correlation between choosing the category "Like slightly" and the number of brothers and sisters living at home with the subject. Subjects who had more siblings tended to choose this category less than other subjects.

Spaghetti with Tomato and Meat Sauce

This food was another liked by an overwhelming number of the subjects with a total of 90% checking categories one and two. Only 3% indicated that they disliked spaghetti very much, and less than 1% indicated unfamiliarity with the product.

Cooked Cauliflower

Thirty-six percent of the students indicated a liking for cooked cauliflower, while 34% checked the "Dislike very much" category. Twelve percent indicated that they were unfamiliar with cooked cauliflower. There was a positive correlation between checking the category entitled "Like slightly" and the number of years of education of the father. Again, perhaps this indicates more sophistication about vegetables in subjects from those families where the father was more highly educated than from other families. Data presented earlier in this chapter indicated a positive relationship between years of education of the father, and the number of servings of a variety of vegetables consumed by the subject. Correlations were positively significant at the 1% level between those indicating unfamiliarity with cauliflower and the subjects' being nonwhite, and the subjects' father being a farm laborer. In other words, black subjects and subjects whose fathers were farm laborers were less familiar with this vegetable. There were negative correlations with the number of years of education of the father, as well as the father being employed as a professional person and the subjects checking the "Unfamiliar" category. This would reinforce the positive relationships presented above with the "Like slightly" category for cauliflower.

Cooked Beets

Cooked beets were liked by only 32% of the students in the study, while 38% indicated that they disliked them very much. Only 4% indicated unfamiliarity. For those checking the "Like very much" category, there was a positive correlation between this and the subjects' being female, indicating that the girls in the study liked beets better than did the boys. On the other hand, there was a negative correlation with the religion of the subject and his family being Roman Catholic. There was a positive correlation between being unfamiliar with beets, and the subject being nonwhite, indicating that the black subjects were less familiar with them than were the white subjects.

Chocolate Cake

A total of 87% of the subjects involved in the study indicated that they liked chocolate cake. Only 2% checked the category "Dislike very much," and less than 1% indicated unfamiliarity with the food.

Baked Custard

Forty-eight percent of the students involved in the study indicated that they liked baked custard, while 18% disliked it very much and 12% were unfamiliar with it. There was a positive correlation between those subjects checking the "Dislike very much" category and the subject's being female, indicating that boys liked custard better than girls did. On the other hand, there was a negative correlation between this attitude and the mother's age. In other words, the subjects with younger mothers disliked custard more than subjects with older mothers. Perhaps custard as a food is losing favor with younger people, and is not being served as often now by young mothers. There was a positive correlation between the subject's father being employed as a manager and his indicating unfamiliarity with baked custard.

Whole Milk

Most of the students liked whole milk, with a total of 89% checking categories one and two. Only 3% disliked it very much, and less than 1% indicated unfamiliarity.

Cola Beverages

The figures in the various categories for cola beverages were almost identical with those of milk, indicating excellent acceptance of both these items by the teenagers involved in the study.

Hard-Cooked Eggs

Sixty-eight percent of the students indicated that they liked hard-cooked eggs, while 10% indicated that they disliked them very much. Less than 1% were unfamiliar with the food. There was a negative correlation between choosing the "Like slightly" category, and the number of hours of work the subject performed outside of school. In other words, the more hours a subject worked, the less likely he was to have chosen the "Like slightly" category with respect to hard-cooked eggs. It is not clear into which other category his response did go.

Pork Chops

Again, pork chops were liked by a great majority of the students--89%. Only 2% disliked them very much, while less than 1% indicated that they were unfamiliar with them.

Oatmeal

Sixty-five percent of the students involved in the study indicated that they liked oatmeal, while 14% chose the "Dislike very much" category. One percent indicated unfamiliarity with the product. There was a positive correlation between disliking the oatmeal very much and the sex of the subject being female indicating that the boys in the study liked oatmeal better than the girls did.

TABLE 9

Percentages of Subjects Listing a Variety of Attitudes Towards Selected Foods

Food Item	1 Like very much %	2 Like slightly %	3 Neither like nor dislike %	4 Dislike slightly %	5 Dislike very much %	6 Do not know, as subject was unfamiliar with it %
French fried potatoes	85	12	2	1	0	0
Lasagne	27	14	11	5	6	38
Chili con carne	41	22	14	7	8	8
Chop suey	30	20	13	8	21	7
Fried calves' liver	13	8	9	7	41	24
Sauerkraut	20	19	13	9	34	6
Pizza	80	11	4	2	3	0
Fried scallops	37	18	13	7	9	16
Cooked spinach	23	16	10	10	37	3
Pancakes	56	25	10	4	5	0
Spaghetti with tomato and meat sauce	75	15	6	2	3	0
Cooked cauliflower	22	14	10	9	34	12
Cooked beets	18	14	13	13	38	4
Chocolate cake	71	17	8	2	2	0
Baked custard	29	19	16	8	18	12
Whole milk	77	12	5	2	3	0
Cola beverages	79	12	5	1	2	0
Hard-cooked eggs	44	24	13	8	10	0
Pork chops	70	19	6	3	2	0
Oatmeal	37	28	13	7	14	1

CHAPTER 4

NUTRITIONAL CHARACTERISTICS OF THE TOTAL SURVEY POPULATION

One of the main purposes for investigating the food habits of teenagers, as has been done in Chapter 3, is to try to ascertain if there is any effect on the nutritional status of these youngsters. Although no laboratory analyses were undertaken in the present study, certain nutritional and health characteristics were examined, and these will be discussed for the total survey population in this chapter.

Recommended Dietary Allowances

The Food and Nutrition Board of the National Research Council has established a series of Recommended Dietary Allowances (RDA) for a number of nutrients known to be essential to the health and well-being of humans.[1] These are expressed quantitatively, as daily intakes, for different segments of the population. The RDA for the nutrients considered in this study for 14 to 18 year olds, both boys and girls, are given in Table 10 (p. 124). It should be pointed out here that these were designed to cover all normal people in the population, and hence can be considered generous allowances. Therefore, if a teenager does not consume 100%

[1]National Academy of Sciences, Recommended Dietary Allowances, p. 101+.

of the RDA for a given nutrient, it does not necessarily mean that he is malnourished with respect to that nutrient. On the other hand, these allowances do constitute a valid, scientific interpretation of current nutritional research upon which to make comparisons. Therefore, the percentage intake of the RDA for several nutrients by the subjects in this study has been determined.

Calories

The Recommended Dietary Allowance for boys in the 14-18 year age group is 3,000 kilocalories per day, while for girls in the 14-16 year age group it is 2,400, and for girls 16-18 it is 2,300 kilocalories per day. Based on the age and sex of the subject, the mean caloric intake of all subjects in the study was 93.9% of their RDA. This information is shown in Table 10 (p. 124).

Simple correlations were done between the percentage caloric intake of the RDA and the socio-economic factors determined by the present study. These results are given in the Appendix in Table B5 (p. 337). There was a negative correlation, significant at the 1% level, between the sex of the subject being female, and the percentage of the RDA for calories that was consumed. In other words, the girls in the study failed to meet the RDA for their age and sex more often than the boys did. This again, supports previously mentioned studies which indicate that the teenage girl is less well nourished than the teenage boy. There was also a negative correlation, significant at the 1% level, between the percentage of the RDA for calories consumed and the father's occupation as a farm laborer indicating that subjects within this group also met the RDA less often than did other subjects. The correlation between the percentage of the RDA for calories consumed and the years of education of the father was positive and also significant at the 1% level. The subjects whose fathers had more years of education were more apt, then, to meet or to exceed the RDA for calories.

There were several correlations significant at the 5% level between the percentage of the RDA for calories consumed and the socio-economic factors determined by the study. Three of these were negative: the subject's not having had pneumonia in the past five years, the mother's hours of work per week outside of the home, and the father's occupation in a service profession. The other three correlations which were significant at the 5% level were positive: the father's origin in the North Central region of the United States, excluding Michigan, the mother's origin outside of the North Central United States, and the religion of the family being Protestant.

These correlations indicate that a variety of factors affected the subject's percentage consumption of the RDA for calories. Factors adversely affecting the caloric intake included the hours the mother worked outside the home. This might well indicate less attention from the mother in terms of the subjects' total food intake for the day. The father's occupation as either a farm laborer or a service worker also negatively affected the caloric intake, possibly because of economic considerations. If the subject had had pneumonia recently, his percentage intake of the RDA for calories was higher suggesting more careful attention to his diet. The parents' origin also positively affected caloric intake in certain instances as subjects whose fathers came from the North Central region of the United States, excluding Michigan, and those whose mothers came from outside the North Central region tended to have a higher percentage consumption. This might well reflect eating patterns brought with them to Michigan from elsewhere, and superimposed upon their own families. Those subjects who were Protestant also had a higher percentage consumption of the RDA for calories, again indicating some underlying factor for these people which included this kind of behavior.

Protein

The RDA for protein for boys in the 14-18 year age group is 60 grams per day, and for girls in this age group 55 grams per day. It can be seen from Table 10 (p. 124) that there was little trouble meeting the RDA for this particular nutrient, with even the lowest quartile above 100% of the RDA. The mean intake of protein was 157.4% of the RDA.

Simple correlations were done between the percentage of the RDA of protein consumed by the subjects in the study and the socio-economic factors elicited. Again, there was a negative correlation, significant at the 1% level between the sex of the subject being female and the percent of the RDA of protein consumed, indicating the girls in the study were less likely to have a high percentage consumption. Also significant at the 1% level was the correlation with the years of education of the father. Therefore, subjects whose fathers had more education tended to consume a higher percentage of the RDA for protein. There was a negative correlation, significant at the 5% level, between the percent of the RDA of protein consumed and the subject's not having had pneumonia in the past five years. Thus, subjects who had had pneumonia recently tended to have a higher percentage intake of protein as well as calories.

Calcium

The RDA for calcium for boys and girls in this age group is quite high: 1.4 gm. for boys and 1.3 gm. for girls. Being able to ingest this amount of calcium is closely tied to the consumption of milk and milk products, for without the inclusion of these foods in the diet, it is very difficult to achieve the RDA. The mean percentage intake of the RDA for calcium for the subjects in this study was 90.8, with the lowest quartile ingesting only 52.3%. These results are shown in Table 10 (p. 124).

The correlations done between the percentage of the RDA of calcium consumed by the subjects and the socio-economic factors determined by the study yielded three significant relationships at the 1% level (Table B5, p.337). As before, there were negative correlations between percent calcium intake and the subjects being female, and also the subject's not having had pneumonia within the five years previous to the time he was interviewed. On the other hand, there was a positive correlation between the years of education of the father and the percent of the RDA of calcium consumed by the subject. This was also true of percentage calories consumed.

There were also three correlations significant at the 5% level. There was a negative correlation between the subject's age and the percent of the RDA of calcium that he ingested. This might indicate a decline in milk drinking as the teenager gets older. There were positive correlations between percent calcium consumed and the father's origin in North Central United States, excluding Michigan, perhaps indicating an influence from the milk drinking patterns of these fathers which they acquired earlier. There was also a positive correlation with the father's occupation as a professional man. This last factor, of course, is related at least in part to the years of education of the father, and might well be related to awareness of the importance of calcium intake, or income, or both.

Iron

The intake of iron was the lowest of all nutrients for the subjects in this study when expressed as the percentage of intake of the RDA. The suggested allowance for both boys and girls in the 14-18 year age group is 18 mgs. per day. The mean percent intake of iron by all subjects in the study was 70.4%, with the lowest quartile ingesting only 44.0% and less, and the highest quartile taking in 89.6% or more. These results are shown in Table 10 (p. 124).

When simple correlations were carried out between the percent intake of the RDA of iron, and the socio-economic factors examined in the study, there were two correlations significant at the 1% level. These were a negative correlation between percent iron intake and the subject's being female, and a positive correlation with the years of education of the father. These same relationships have been noted for many of the nutrients already discussed.

Several correlations were significant at the 5% level. There was a negative relationship shown to exist between the percent of the RDA of iron consumed by the subject, and the subjects not having had pneumonia within the five years previous to this study again suggesting careful attention to the diet by those who had had pneumonia recently. There was also a negative relationship between the percent of iron consumed and the number of hours the subjects' mother worked outside the home each week, as well as the subjects' father being employed in a service profession. Both of these factors also affected adversely the percentage intake of other nutrients previously discussed, and the same assumptions as to cause would apply here as well. There were two positive correlations also: with the father's origin in the North Central region of the United States, excluding Michigan, and the mother's origin outside of the North Central United States. These last two factors also positively affected the subjects' intake of calories, indicating that at least in the case of iron, with more calories it is possible to achieve a higher percentage intake of another nutrient. In other words, the types of foods chosen by these families would seem to be those at least moderately rich in iron. These results are all tabulated in Table B5 (p. 337).

Vitamin A

The RDA for boys and girls, ages 14 to 18 years, for vitamin A is 5,000 I.U. per day. The mean percentage intake for all subjects in the study was 99.2% of the RDA. However, the lowest quartile consumed 37.4% or less, indicating a very low intake for several of the youngsters (Table 10, p. 124).

There were two simple correlations significant at the 1% level between percent of the RDA of vitamin A consumed and the socio-economic factors studied. These showed a negative relationship with the subjects being female, and a positive relationship with the years of education of the father again indicating similar relationships to ones already noted for many of the other nutrients. Also there was a correlation, significant at the 5% level, between the percent of the RDA of vitamin A consumed by the subject and the father's occupation in the professional category. This, of course, might well be related to his years of education. These results are presented in Table B5 (p. 337).

Thiamin

The RDA for thiamin for boys 14-18 years of age is 1.5 mg. per day and for girls 14-18, it is 1.2 mg. The mean percent intake of the RDA for thiamin for all persons in this study was 101.9%, with the lowest quartile consuming 60.7% or less and the highest quartile 127.3% or more (Table 10, p. 124).

Simple correlations carried out between the percent intake of the RDA of thiamin and the socio-economic factors examined in the study showed negative relationships, significant at the 1% level, with the subject's being female, and the subject's not having had pneumonia in the five years previous to the study. Again, these relationships have occurred several times before in connection with other nutrients. There was a positive correlation significant at the 1% level between the subject's intake of thiamin and the hours he worked per week outside of school. This would possibly indicate the use of his income to purchase foods such as hamburgers which are high in thiamin content.

There was one correlation, negative and significant at the 5% level, between the hours the mother worked outside the home per week and the subject's percentage intake of the RDA of thiamin. Again, this might indicate less control of the child's diet if the mother is away from home for long hours.

<u>Riboflavin</u>

The RDA for riboflavin for boys 14-18 years of age, and girls 14-16 years of age is 1.5 mg. For girls 16-18 years of age it is 1.4 mg. The mean percent intake of the RDA for riboflavin for all subjects in the study was 152.7%, with the lowest quartile receiving 92.6% or less (Table 10, p. 124).

Again, there was a negative correlation, significant at the 1% level between the percent intake of the RDA of riboflavin and the subject's being female, and also with the subject's not having had pneumonia in the five years previous to the study. There was a positive correlation, significant at the 1% level between percent riboflavin intake and the father's years of education, indicating again the beneficial effect of education of the father in terms of dietary quality.

Niacin Equivalents

The RDA for niacin equivalents is 20 mg. per day for boys 14-18, 16 mg. for girls 14-16 and 15 mg. for girls 16-18. The mean percent intake of the RDA for niacin for all subjects in the study was 91%, with the lowest quartile receiving 57.5% or less (Table 10, p. 124).

Simple correlations again revealed a negative relationship, significant at the 1% level, between the subject's being female and the percent of the RDA of niacin ingested. There were positive correlations, significant at the 5% level between niacin intake and the subjects being nonwhite, the work hours of the subject outside of school each week, and the years of education of the father. This would indicate that the black subjects had diets which afforded them higher percentages of the RDA for niacin than did white subjects. The higher intake correlated with the hours the subject worked outside of school again might indicate the spending of the additional income for foods high in niacin, such as hamburgers. These results are given in Table B5 (p. 337).

<u>Ascorbic Acid</u>

For ascorbic acid, the RDA is 55 mg. per day for boys 14-18 years of age, and 50 mg. per day for girls in the same age group. The variation in intake for this particular nutrient was quite great, with the mean percent intake of the RDA being 160.6% but with the lowest quartile ingesting 52.7% or less, and the highest quartile 232.1% or more. These results are shown in Table 10 (p. 124).

The simple correlations carried out between the percent intake of ascorbic acid and the various socio-economic variables studied showed a negative relationship, significant at the 1% level, between the subject's being female and her ascorbic acid intake, and also with the subject's not having had pneumonia in the five years previous to the study. There were positive relationships, also significant at the 1% level, between the subject's intake of ascorbic acid and the years of education of the father as well as his occupation as a professional man. All of these relationships have been noted for several of the nutrients discussed previously.

There were also three correlations significant at the 5% level. There was a negative relationship between the subject's percent intake of the RDA of ascorbic acid and the mother's hours of work per week outside the home, again indicating less positive influence of the mother on the child's diet with longer hours away from home. There were positive correlations with the number of moves the subject's family had made in the five years previous to the study, and also with the subject's family adhering to the Protestant religion. As ascorbic acid intake is dependent solely on the consumption of fruits and vegetables, this implies eating habits developed in the more mobile families that included greater intake of these kinds of foods. This would also be indicated in those families who were Protestant. These results are tabulated in Table B5 (p. 337).

TABLE 10

Recommended Dietary Allowances for 14-18 Year Old Boys and Girls, and the Mean Percentage of these Consumed by the Total Survey Population

	Recommended Dietary Allowances[a]			Percentage of the Recommended Dietary Allowances of the various nutrients consumed by subjects[b]		
	Boys 14-18	Girls 14-16	Girls 16-18	Mean	Lowest Quartile	Highest Quartile
				%	%	%
Kilocalories	3000	2400	2300	93.9	66.5	114.8
Protein-grams	60	55	55	157.4	106.9	198.4
Calcium-grams	1.4	1.3	1.3	90.8	52.3	117.8
Iron-mg.	18	18	18	70.4	44.0	89.6
Vit. A-I.U.	5000	5000	5000	99.2	37.4	111.3
Thiamin-mg.	1.5	1.2	1.2	101.9	60.7	127.3
Riboflavin-mg.	1.5	1.5	1.4	152.7	92.6	193.6
Niacin Equivalents-mg.	20	16	15	91.0	57.5	114.8
Ascorbic Acid-mg.	55	50	50	160.6	52.7	232.1

[a]Source: National Academy of Sciences, Recommended Dietary Allowances, Seventh Revised Edition, Publication 1694, Washington, D.C., 1968, p. 101+.

[b]Comparable figures for the absolute amounts of total nutrients consumed by the survey population are given in Table 5, p. 65.

Weight-Height Relationship

The weight-height relationship is one possible method of assessing overweight and underweight in humans. Although it is not as precise as other methods such as x-rays, it has the advantage of being easily carried out with a large group of subjects, and it can give an indication as to the relative weight of either an individual or a population.

The method used to determine weight-height relationships in the present study was the one outlined by D. W. Sargent. She states

> From this average weight-height relationship, six classifications for characterizing gross body size (without reference to skeletal size, muscle mass or adipose tissue) were developed for use in classifying subjects for nutritional studies. Numerical values for average weight for height and for boundary lines for the six classifications are presented.[2]

Scales, and a measuring device for height were carried to the different schools and the weight and height of each subject in the study was determined at the time of the interview. This information was then used to classify each subject on the basis of Sargent's tables into one of six categories: (1) Underweight, (2) Slender, (3) Normal, (4) Stocky, (5) Overweight, (6) Obese. The figures are given in Tables 11 and 12 (pp. 128-29).

The range of figures for the total survey population, then, was between the number assigned the Underweight category,

---

[2]Sargent, p. 324.

1.0, and the number assigned the Obese category, 6.0. The mean figure was 2.846, or just slightly below "Normal." The lowest quartile figure was 2.004 and the highest quartile 3.035. Distribution of the 911 subjects into the six groups was as follows:

Underweight	Slender	Normal	Stocky	Overweight	Obese
95	221	436	71	53	35

Thus it can be seen that although most of the subjects fell into the slender, normal and stocky range, there were a goodly number of subjects who were either underweight (-15 percent or less of average weight), overweight (+15 to +30 percent of average weight) or obese (+30 percent or more of average weight).

Simple correlations were carried out between the numerical category (1-6) into which the subject was classified by his weight-height ratio, and the socio-economic factors determined in this study. There were several correlations significant at the 1% level. There was a negative correlation between years of education of the father, and also the father's occupation as a professional man, and the weight-height category of the subject. As these categories ranged from underweight (1) to obese (6), this would indicate a relationship with below average weight for subjects whose fathers were employed in professional occupations, and who had more years of education. On the other hand, there were positive correlations between the weight-height category and the mother's hours of work outside the home, the father's occupation as an operative, and the family's religion being listed as none. These would show a positive relationship with the higher weight-height categories indicating more of a tendency towards overweight in the subjects whose mother worked outside of the home for long hours, in those subjects whose fathers were operatives, and in those subjects whose families adhered to no particular religion.

There were three positive correlations significant at the 5% level. These were with age, with the subject's being male, and with the subjects not having had mononucleosis in the past five years. In each of these cases, then, the relationship was with those who were in the higher weight-height categories. In the case of age, it is perhaps to be expected that the older subjects tended towards overweight more than did the younger subjects. In many of the older subjects perhaps the height gain had ceased, but the weight gain had not. Also it is not surprising that the males in the study tended more towards overweight as the figures have consistently shown that they consumed more food. Finally, there is a relationship between tending towards overweight and not having had mononucleosis recently. Stated the other way around, those subjects who had had mononucleosis tended more towards underweight.

TABLE 11

Average Weight in Pounds for Height and Boundary Weights Between Weight-for-Height Classifications for Young Men[a]

Height (in.)	Underweight (1)	Slender (2)	Normal (3)	Stocky (4)	Overweight (5)	Obese (6)
63	111	121	131	141	151	170
64	114	124	134	144	155	175
65	117	128	138	148	159	179
66	120	131	141	152	163	184
67	123	134	145	156	167	188
68	126	138	149	160	171	193
69	130	141	152	164	175	198
70	133	145	156	168	180	203
71	136	148	160	172	184	209
72	140	152	165	177	189	214
73	143	156	169	181	194	219
74	147	160	173	186	199	225
75	151	164	178	191	204	231
76	155	168	182	196	209	237
77	159	173	187	201	215	243
78	163	177	192	206	220	249

[a]Underweight = -15 percent or less of average weight
Slender = 7.5 to -15 percent of average weight
Normal - average weight computed for men from the equation, W = 26.7e 0.025311 and for women, W = 9.50e
Stocky = +7.5 to +15 percent of average weight
Overweight = +15 percent to +30 percent of average weight
Obese = +30 percent or more of average weight

Source: Dorothy W. Sargent, Weight-height relationships of young men and women. Am. J. Clin. Nutr. 13:322, 1963

TABLE 12

Average Weight in Pounds for Height and Boundary Weights Between Weight-for-Height Classifications for Young Women[a]

Height (in.)	Under-weight (1)	Slender (2)	Normal (3)	Stocky (4)	Over-weight (5)	Obese (6)
58	88	95	103	111	119	134
59	90	98	106	114	122	138
60	93	101	109	117	125	142
61	95	104	112	120	129	146
62	98	106	115	124	132	150
63	101	109	118	127	136	154
64	103	112	122	131	140	158
65	106	116	125	134	144	162
66	109	119	128	138	148	167
67	112	122	132	142	152	172
68	115	126	136	146	156	176
69	119	129	140	150	160	181
70	122	133	143	154	165	186
71	125	136	147	158	170	192
72	129	140	152	163	174	197
73	132	144	156	167	179	202
74	136	148	160	172	184	208

[a]Underweight = -15 percent or less of average weight
Slender = 7.5 to -15 percent of average weight
Normal = average weight computed for men from the equation, W = 26.7e 0.025311 and for women, W = 9.50e
Stocky = +7.5 to +15 percent of average weight
Overweight = +15 percent to +30 percent of average weight
Obese = +30 percent or more of average weight

Source: Dorothy W. Sargent, Weight-height relationships of young men and women. Am. J. Clin. Nutr. 13:322, 1963

Consumption of Vitamin Preparations

The consumption of supplemental vitamin preparations, either in the form of single vitamins or as multi-vitamin pills is wide-spread in the United States. For some consumers, they undoubtedly provide vitamins that are not forthcoming from a faulty diet. However, as Guthrie states "Many persons are buying and consuming vitamins in excess of their daily needs."[3] One of the goals of this study was to determine how wide-spread, both quantitatively and geographically, the consumption of vitamin preparations was by the teenage population. Therefore, each subject was asked if he ever took such a preparation, and if he did, how often and what kind. Almost without exception, if they were consumed by the teenager, they were of the multivitamin type, and were taken fairly regularly, usually daily. No attempt was made to add on the vitamins received in this form to the vitamins obtained from the food in the 24 hour recall period.

Of the 911 subjects in the total survey population, 224, or 23%, took vitamin preparations on a regular basis, usually daily. The geographical distribution of these teenagers will be discussed in Chapter 6.

Simple correlations were carried out to determine if there was any relationship between the consumption of vitamin preparations and the socio-economic factors determined by

---

[3]Helen A. Guthrie, Introductory Nutrition, 2nd edition, (Mosby: St. Louis), 1971, p. 187.

this study. There were several correlations significant at the 1% level. There was a negative relationship between the intake of a vitamin preparation by the subject and the subject's work hours per week outside of school, and also the mother's work hours per week outside the home. In other words, a smaller percentage of subjects who worked outside of school, and of those whose mothers worked outside the home took vitamin preparations. In both instances this might indicate a lesser control of the teenager on the part of the family. There was also a negative correlation with the subject's father being employed as an operative indicating that a smaller percentage of these subjects also took vitamin preparations. On the other hand, there was a positive correlation between the intake of a vitamin preparation by the subject, and the years of education of the father, and also the father's occupation as a professional person, indicating that a greater percentage of these subjects took vitamin preparations. This might indicate differences in goals for this group of people and/or affluence.

There were two negative correlations significant at the 5% level involving the consumption of vitamin preparations by the subjects, indicating that a smaller percentage of these groups consumed them. These were with the subject's being nonwhite, and the number of brothers and sisters the subject had living at home. Again, these relationships might well be due in part to economics, as vitamin preparations are certainly not inexpensive.

Factor Analysis

As indicated in the chapter on methodology, the Factor A program developed by the Computer Institute for Social Science Research at Michigan State University was used in an attempt to discover if any underlying patterns existed in the large number of variables collected on the subjects in the study. Of the 268 variables used in the other analyses thus far discussed, 96 were selected by the author on the basis of correlation coefficients already run and knowledge of those that would contribute most to further analysis. These 96 variables are named in Table 13 (pp. 136-39).

For the principal axis solution of the factor analysis, eigen-values were generated, and 38 had a value greater than one, indicating that there were 38 factors in the unrotated solution which explained more than a single variable.

The factors were then rotated to produce an analytic orthogonal solution so that distinct clusters of relationships, if such existed, would be delineated. The rotated factors produced were limited to ten, and seven of these are presented in Table 13. These seven factors showed interesting relationships with respect to food habits and nutritional status, while the remaining three factors showed relationships only among the socio-economic and cultural variables without any relationship to either food habits or nutritional status.

Factor 1, which is labeled the Nutrient Intake Factor, shows very high loadings on all of the nutrient intake variables and in addition, shows high loadings on many of the food group variables. Another high loading in this factor is sex. This is the only negative loading here, and as boys were coded 1 and girls, 2, this would indicate a positive relationship between boys and nutrient and food intake, and a negative relationship existing for girls. This again agrees with much of the research done both in this study and previously by other researchers on teenage nutrition, indicating that whereas in general teenage boys eat well, and have a good nutrient intake, the teenage girl tends to be the most poorly nourished member of the American family.[4]

Factor 2, which is labeled the Meal Environment Factor, has its highest loadings on the variables which show where and with whom the day's total calories and protein were consumed for each subject. It can be seen that high positive loadings exist for calories and protein eaten with friends and at school, and high negative loadings exist for the same nutrients eaten at home. This would indicate then the existence of one type of food habit pattern in which a student eats most of his calories and protein with friends, and most of this at school, though these loadings are not quite as high, but he eats little of his protein and calories at home. Food consumed with friends, mainly at school, then, is obviously very important for one segment of the population.

Two other factors show meal relationship patterns. Factor 7, the Family Meal Factor, and Factor 9, the Solitary Meal Factor, both indicate different types of eating patterns which exist for the consumption of the daily total intake of

---

[4] _Ibid_., p. 372.

protein and calories. In Factor 7, there is a high positive loading on the variables indicating the percentage of total calories and protein consumed with some of the family eating together. On the same factor is a high negative loading on the variables indicating the absence of the whole family eating together. This would seem to indicate that the students who consumed most of their calories and protein with some of the family did not have, for the most part, the family meal pattern where the entire family sat down together for a meal. In fact, the high negative loadings suggest that this pattern did not exist. Factor 9, the Solitary Meal Factor, shows the same type of relationship for the subject who eats alone. If he consumes most of his calories and protein alone, then again the meal pattern with the entire family eating together did not exist for him.

Two other factors, Factor 3 and Factor 6, are also related to meal patterns. Factor 3, the Meal-Snack Factor, indicates the rather obvious relationship between meals and snacks. The loadings have a high positive value for percent of calories and protein from meals and a high negative value for percent protein and calories from snacks. Interesting to note is that the values for both calories and protein are about the same. In other words, in general a student apparently does not get his calories from soft drinks and potato chip snacks, and his protein from meat and milk meals. This might indicate that foods consumed as snacks are not as non-nutritious as some experts have conjectured. Factor 6, the Meal Away From Home Factor, shows the same relationship with high loadings for both percentage of calories and protein eaten away from home, and could be interpreted in the same way.

A final factor which related variables connected with food habits is Factor 8, Food Purchasing and Preparation. In the two variables with high loadings, the question was asked, who is the person in your family with the major responsibility for purchasing and preparing the food? In variables 111 and 120, if the answer was Mother, a code of 1 was assigned, and if the answer was anyone else, a code of 0. Thus, in the subject's families who contributed to this factor, Mother was still the major food purchaser and preparer, both, though the higher loading on preparation would indicate that this is her role more consistently than purchaser.

The communalities generated by the Varimax rotation are also presented in Table 13. These communalities indicate the proportion of variation accounted for by each variable in the total factor analysis. Table 14 shows these communalities grouped together by rank and variable name for those with a numerical value over .2000. It can be seen that those accounting for the highest proportion of variation are related to the variables concerned with where and with whom calories and protein were consumed, as well as nutrient intake and food groups consumed. Socio-economic and cultural variables that show a fairly high communality include father's age and education, mother's age, and mother's and father's origin.

TABLE 13

Factors Produced by Rotated Analytic Orthogonal Solution Involving 96 Selected Nutritional and Socio-Economic Variables Derived from the Survey Data

	Variable	FACTORS 1[a]	2[b]	3[c]	6[d]	7[e]	8[f]	9[g]	Communal-ities
1	Fat-grams	.912	-.013	-.011	.042	.035	.073	.007	.8421
2	Carbohydrate-grams	.848	.069	-.155	-.019	.087	.054	-.023	.7659
3	Calories-% RDA	.926	.020	-.113	.006	.044	.024	-.052	.8801
4	Protein-% RDA	.916	-.028	.064	.034	.022	.022	.034	.8484
5	Calcium-% RDA	.797	-.023	-.098	-.094	.065	.055	.168	.6950
6	Iron-% RDA	.872	.005	-.008	.051	-.010	.013	-.047	.7748
7	Vitamin A-% RDA	.417	-.054	.079	-.099	-.052	-.090	-.034	.2178
8	Thiamin-% RDA	.776	-.062	.017	.065	-.045	-.036	-.082	.6224
9	Riboflavin-% RDA	.878	-.049	.090	-.053	.032	.037	.117	.8043
10	Niacin-% RDA	.730	-.011	-.091	.117	-.047	-.046	-.066	.5731
11	Ascorbic Acid-% RDA	.435	-.009	-.009	.018	-.048	-.050	-.132	.3236
12	% Calories-Meals	.011	.020	.929	-.026	-.045	.010	-.093	.8763
13	% Calories-Snacks	.002	-.020	-.931	.015	.049	.002	.090	.8794
14	% Calories-Alone	-.056	-.168	-.231	-.009	-.091	.034	.871	.8553
15	% Calories-All of Family	.042	-.397	.234	-.154	-.650	.048	-.499	.9161
16	% Calories-Some of Family	.039	-.182	.038	-.002	.922	-.075	-.218	.9418

[a]Factor 1 is the Nutrient Intake Factor
[b]Factor 2 is the Meal Environment Factor
[c]Factor 3 is the Meal-Snack Factor
[d]Factor 6 is the Meal Away From Home Factor
[e]Factor 7 is the Family Meal Factor
[f]Factor 8 is the Food Purchasing and Preparation
[g]Factor 9 is the Solitary Meal Factor

TABLE 13--Continued

Variables		FACTORS 1	2	3	6	7	8	9	Communalities
17	% Calories-Friends	-.021	.882	-.070	.200	-.044	-.009	-.110	.8387
18	% Calories-Home	.022	-.838	.044	-.434	-.007	-.021	.061	.9024
19	% Calories-School	.027	.840	.184	-.343	-.015	-.083	.021	.8704
20	% Calories-Elsewhere	-.041	.226	-.221	.845	.026	.115	-.098	.8536
21	% Protein-Meals	-.032	.020	.881	-.044	.035	.020	-.158	.8085
22	% Protein-Snacks	.048	-.021	-.889	.032	-.032	-.005	.157	.8210
23	% Protein-Alone	-.043	-.148	-.181	.016	-.103	.025	.896	.8732
24	% Protein-All of Family	.046	-.394	.188	-.166	-.655	.043	-.512	.9173
25	% Protein-Some of Family	.013	-.180	.018	.010	.931	-.061	-.188	.9418
26	% Protein-Friends	-.020	.900	-.066	.187	-.052	-.007	-.089	.8619
27	% Protein-Home	.016	-.851	.045	-.402	-.000	-.019	.054	.8948
28	% Protein-School	.022	.863	.156	-.321	-.007	-.073	.010	.8828
29	% Protein-Elsewhere	-.034	.247	-.207	.840	.011	.110	-.084	.8409
30	Milk - # of servings	.699	-.058	.081	-.078	.057	.088	.216	.5672
31	Protein Foods - # of servings	.606	-.042	-.012	.090	.010	-.009	-.028	.3852
32	Vegetables - # of servings	.422	.007	-.054	.059	-.156	.021	-.165	.2428
33	Fruits - # of servings	.234	.011	-.041	-.074	-.055	-.038	-.056	.2333
34	Grain - # of servings	.634	.070	-.106	-.103	.150	.071	.068	.4629
35	Fats & Oils - # of servings	.438	-.026	.019	.108	-.059	-.008	-.087	.2263
36	Sugars & Sweets - # of servings	.355	.057	-.262	.151	.095	.018	-.082	.2678
37	Weight/Height Ratio	-.097	.036	.088	.030	.011	-.196	.033	.0942
38	Purchaser-Mother	-.025	.037	.009	.096	.004	.656	.021	.5375
39	Purchaser-Mother & Self	-.073	-.033	-.056	-.051	.037	-.337	-.001	.1341
40	Purchaser-Mother, Self & Others	.037	.014	.006	-.017	.009	-.185	-.020	.0418
41	Purchaser-Mother & Father	.074	-.062	-.072	-.014	-.065	-.316	-.053	.1598
42	Purchaser-Father	-.035	.015	.036	.055	-.019	-.155	-.023	.1240
43	Purchaser-Self	-.022	.031	.026	.037	.029	-.312	.093	.1191
44	Purchaser-Self & Others	.057	.009	.052	.134	.075	-.151	.033	.0641
45	Purchaser-Other	.053	-.010	.089	.237	.053	-.206	.009	.1263

TABLE 13--Continued

Variables		FACTORS 1	2	3	6	7	8	9	Communal-ities
46	Preparer-Mother	.086	-.007	.064	-.033	.022	.813	.018	.7227
47	Preparer-Mother & Self	-.110	.016	-.050	-.043	-.024	-.372	-.064	.2088
48	Preparer-Mother, Self & Others	.014	-.046	-.105	-.030	.014	-.236	-.083	.0805
49	Preparer-Mother & Father	-.002	-.004	-.137	.061	.058	-.147	-.050	.0539
50	Preparer-Father	.025	.059	.051	.031	.081	-.233	.029	.0810
51	Preparer-Self	-.121	.035	.000	.046	-.071	-.409	.056	.1985
52	Preparer-Self & Others	-.028	.019	.038	.042	.013	-.132	.004	.0398
53	Preparer-Grandmother	.052	.016	-.131	-.055	-.012	-.111	-.035	.0605
54	Preparer-Other	.062	-.065	.077	.145	-.042	-.260	.067	.1435
55	Vitamin Preparation Consumed	-.033	.051	-.013	.017	.026	-.054	-.092	.0746
56	Age	-.066	.006	.160	.366	-.133	-.199	.000	.3256
57	Grade	-.048	-.003	.149	.336	-.126	-.181	.057	.3305
58	Sex	-.499	-.034	-.102	-.025	-.074	-.212	-.166	.3738
59	Color	.033	.121	.129	-.065	-.069	.014	-.043	.3168
60	# of Illnesses	-.027	.077	.016	.041	.053	-.113	-.045	.0428
61	Rheumatic Fever	.072	-.075	.024	-.104	.052	.034	.079	.0426
62	Pneumonia	-.094	-.036	-.033	-.137	-.063	.031	-.019	.0615
63	Work-Hrs/Week	.091	.124	.007	-.065	-.069	.014	-.043	.2754
64	Father's Age	-.043	-.018	-.041	.041	.053	-.113	-.045	.6904
65	Father's Education	.100	-.032	.073	-.104	.052	.034	.079	.5450
66	Mother's Age	-.040	-.021	-.028	-.137	-.063	.031	-.019	.7173
67	Mother's Work Hrs/Week	-.060	.029	-.008	.424	-.066	.055	.079	.1600
68	# of Moves in 5 Years	.023	-.061	-.017	-.009	-.027	-.069	.069	.1308
69	# of Siblings	.004	.052	.014	.027	.020	.087	.144	.3434
70	Father-Professional	.037	-.061	.061	.002	-.041	-.019	.076	.3328
71	Father-Farmer	-.028	.015	.023	-.017	-.040	-.352	-.049	.0481
72	Father-Manager	.031	.038	-.010	.083	.037	-.033	-.049	.1039
73	Father-Clerical	.007	.080	-.110	-.007	-.024	-.009	-.001	.0315

TABLE 13--Continued

Variables	1	2	3	6	7	8	9	Communal-ities
74 Father-Sales	.010	-.016	-.061	-.012	-.017	.115	.154	.0552
75 Father-Craftsman	.011	-.031	.066	-.059	-.079	-.043	-.060	.1406
76 Father-Operative	-.002	-.035	-.059	.034	-.039	.027	-.073	.1926
77 Father-Service	-.084	.075	.032	-.088	-.033	-.032	-.046	.0411
78 Father-Farm Laborer	.048	-.049	-.091	.168	.076	-.060	.028	.0327
79 Father-Other Laborer	-.037	.053	.020	-.072	.053	.100	.003	.0635
80 Father-Michigan	-.027	.000	-.007	-.021	-.047	-.104	-.033	.6021
81 Father-North Central	.056	.048	-.008	.055	.072	.011	-.017	.1814
82 Father-Other	.033	-.036	-.003	-.053	.034	.036	-.045	.5172
83 Mother-Michigan	-.011	.011	-.021	-.055	-.008	-.150	-.021	.6371
84 Mother-North Central	-.006	-.038	-.009	.046	-.028	.046	-.022	.1221
85 Mother-Other	.052	-.006	.006	-.040	.042	-.064	.002	.4480
86 Protestant	.028	.034	-.043	.026	.012	.048	-.168	.2742
87 Roman Catholic	-.007	-.065	.001	.092	-.013	-.060	.141	.1036
88 Jewish	-.035	-.032	-.002	.031	-.068	-.014	.007	.0419
89 Mixed	.054	-.031	-.003	-.067	-.021	.110	.120	.0407
90 Religion-Other or None	-.001	.042	.064	-.040	.022	-.030	.033	.1690
91 Lasagne-Like Very Much	-.110	-.060	-.000	.003	.044	-.166	-.007	.2078
92 Lasagne-Like Slightly	.006	-.052	.058	.192	.025	.047	.013	.0595
93 Lasagne-Neither Like Nor Dislike	.075	.042	.055	.101	-.011	.031	.121	.0372
94 Lasagne-Dislike Slightly	-.008	.101	.055	-.053	-.011	-.090	.030	.0359
95 Lasagne-Dislike Very Much	.023	-.033	-.039	-.040	-.071	-.008	.072	.0434
96 Lasagne-Unfamiliar	.062	.035	-.083	-.162	-.012	.141	-.129	.2675

TABLE 14

Factor Analysis Communalities Ranked in Order of Contribution to Total Factor Analysis

Variable Name	Proportion of Variation Accounted For
Percent Calories Consumed with Some of Family	.9418
Percent Protein Consumed with Some of Family	.9418
Percent Protein Consumed with All of Family	.9173
Percent Calories Consumed with All of Family	.9161
Percent Calories Consumed at Home	.9024
Percent Protein Consumed at Home	.8948
Percent Protein Consumed at School	.8828
Percent RDA of Calories	.8801
Percent Calories Obtained from Snacks	.8794
Percent Calories Obtained from Meals	.8763
Percent Protein Consumed Alone	.8732
Percent Calories Consumed at School	.8704
Percent Protein Consumed with Friends	.8619
Percent Calories Consumed Alone	.8553
Percent Calories Consumed Elsewhere	.8536
% RDA of Protein	.8484
Fat-Grams Consumed	.8421
% Protein Consumed Elsewhere	.8409
% Calories Consumed with Friends	.8387
% Protein Obtained from Snacks	.8210
% Protein Obtained from Meals	.8085
% RDA of Riboflavin	.8043
% RDA of Iron	.7748
Carbohydrate-Grams Consumed	.7659
Who Prepares Food-Mother	.7227
Mother's Age	.7173
% RDA of Calcium	.6950
Father's Age	.6904
Mother's Origin-Michigan	.6371
% RDA of Thiamin	.6224
Father's Origin-Michigan	.6021

TABLE 14--Continued

Variable Name	Proportion of Variation Accounted For
% RDA of Niacin	.5731
Milk & Milk Products-no. of Servings	.5672
Father's Level of Education	.5450
Who Purchases Food-Mother	.5375
Father's Origin-Other	.5172
Grain Products - no. of servings	.4629
Mother's Origin-Other	.4480
Protein Foods - no. of Servings	.3852
Sex	.3738
No. of Brothers and Sisters	.3434
Father's Occupation-Professional	.3328
Grade in School of Subject	.3305
Age of Subject	.3256
% RDA of Ascorbic Acid	.3236
Color of Subject	.3168
Work-Hrs/Week by Subject	.2754
Religion-Protestant	.2742
Sugars and Sweets - no. of Servings	.2678
Attitude Toward Lasagne-Unfamiliar	.2675
Vegetables - no. of Servings	.2428
Fruits - no. of Servings	.2333
Fats & Oils - no. of Servings	.2263
% RDA of Vitamin A	.2178
Who Prepares Food-Mother & Self	.2088
Attitude Toward Lasagne-Like Very Much	.2078

CHAPTER 5

SPATIAL ANALYSIS OF FOOD HABITS

An analysis of the food habits of the total survey population was given in Chapter 3. No attempt was made at that time to determine whether or not the food habits that existed were spread evenly over space, or whether there were distinct differences in food habits from one part of the total area surveyed to another; therefore, the focus of this chapter and the next will be the spatial variation, if any, of the food habit and nutritional characteristics of the teenage population surveyed.

The enumeration area used in this part of the study, as described in Chapter 2, was the census tract, and, in addition, for the city of Jackson, the city block. It should again be pointed out that the students surveyed were not equally spread over the census tracts involved in the study. All together, there were students from 48 census tracts surveyed. All those from untracted Ingham County, plus small portions of Eaton, Shiawassee, Clinton and Livingston counties were considered together as a 49th census tract. However, because school district boundaries do not necessarily coincide with either political or census boundaries, there was considerable variation in numbers of subjects from the various census tracts. These figures are shown in Table 4 (p. 54). In order to get some idea of the proportion of students interviewed in each census tract compared to the total population of 15 to 19 year olds in the same tract, comparisons were made with the 1960 U.S. Census Tract figures and the results were expressed as percentages. These are also shown in Table 4. It can easily be seen that for some census tracts, such as J-52 and L-34, the proportion of teenagers sampled was high, while in others, such as J-63 and J-64, it was under 1% of the population for that age group. This information is presented spatially in Figure 3 (p. 53). It must be kept in mind, then, in all of the following discussions, that the information for some census tracts is more complete than for others.

In addition, a frequency count was done to determine for each census tract how many times the average subject in that census tract was more than one standard deviation away from the census tract mean for all food habit and nutritional characteristics. In this way, it was felt that the census tracts in which the average subject showed a great deal of variation from the norm could be identified.

Total Nutrients Consumed

Census tract averages were obtained for the number of calories, and the total quantities of fat, carbohydrate, protein, calcium, iron, vitamin A, thiamin, riboflavin, niacin and ascorbic acid consumed by the subjects in the 24 hour recall survey period. These figures are given in Table 15 along with the mean figure for the total survey population. It can be seen at once that there is wide variation in the consumption of all the nutrients from census tract to census tract.

Energy Foods

Figure 4 shows the spatial distribution of the daily mean intake of calories and the energy foods by the high school students surveyed by census tract. In several census tracts there was a daily mean caloric intake of below 2300 per day. These tracts are clustered in central and north urban Jackson, to the west of Lansing, and in East Lansing. (The two census tracts to the south and southwest of Jackson represent only one person each). These clusters represent very different kinds of socio-economic areas with the East Lansing area being highly professionally oriented, and the area west of Lansing being more a "blue-collar" area where many of the families are employed in the automobile industry. The center of Jackson represents a third kind of area as it is very much an urban setting.

TABLE 15

Nutrients Consumed in a Twenty-Four Hour Period:
Mean Intake by Census Tract

	No. of subjects	Calories	Protein grams	Fat grams	Carbo-hydrates grams	Calcium mg.	Iron mg.
Mean Intake		2547	92	118	294	1258	12.8
Census Tract							
J-01	14	2667	97	122	304	1228	11.5
J-02	13	2296	68	98	294	737	10.9
J-03	5	2132	65	99	255	998	9.8
J-04	17	2717	87	126	319	1256	11.2
J-05	5	2996	113	132	357	1958	13.3
J-06	4	1657	80	114	384	1592	9.2
J-07	8	2570	87	117	307	1490	10.6
J-08	46	2679	97	122	309	1287	13.8
J-09	23	2343	80	105	278	960	11.8
J-10	11	2253	83	88	278	1175	12.4
J-11	29	2783	98	127	323	1087	14.7
J-12	22	2490	81	111	304	935	12.5
J-13	39	2592	94	113	311	1069	14.1
J-50	13	2329	91	118	232	931	13.6
J-52	48	2699	93	117	332	1244	12.8
J-53	51	2602	90	120	300	1191	13.3
J-54	3	2318	69	111	267	922	9.7
J-55	18	2564	92	117	299	1241	12.6
J-56	17	3254	120	156	353	1438	17.1
J-57	13	2917	104	142	322	1481	15.1
J-59	3	2339	68	86	299	996	8.5

TABLE 15--Continued

Census Tract	No. of subjects	Calories	Protein grams	Fat grams	Carbo-hydrates grams	Calcium mg.	Iron mg.
J-63	1	1146	29	56	130	108	4.9
J-64	1	2122	75	86	236	830	8.5
J-65	5	3250	123	157	356	1579	18.1
J-66	7	2305	102	114	227	1122	14.2
J-67	35	2528	99	119	274	1144	14.0
J-68	3	3422	101	129	485	1633	15.9
L-17	2	1763	50	61	271	903	9.8
L-34	33	2366	85	113	263	1196	10.9
L-35	19	1879	68	81	227	1067	8.4
DT-201	36	2500	104	117	268	1482	11.9
DT-202	9	1747	68	84	188	781	10.0
DT-203	1	6950	242	389	624	2446	41.5
EL-38	9	2095	82	92	247	1039	11.3
EL-39	6	1748	71	68	222	945	9.5
EL-40	4	2548	114	117	269	1474	16.9
EL-43	11	2206	91	95	262	1286	12.7
EL-44	4	2572	94	122	290	1408	12.8
MT-45	1	2944	134	177	209	2731	9.1
MT-46	12	2367	95	112	255	1240	13.3
MT-47	9	2418	96	124	249	1532	11.5
MT-48	15	2359	81	109	278	1193	12.1
MT-49	48	2733	102	120	324	1656	14.0
MT-50	14	3739	131	156	464	1745	16.9
DH-52	4	2288	85	110	253	1252	10.7
DH-53	13	2387	92	112	265	1289	12.8
DH-54	42	2523	94	120	278	1168	13.1
DH-55	23	2338	84	102	280	1132	14.9
UT	215	2345	80	112	264	1158	11.1

TABLE 15--Continued

Census Tract	No. of subjects	Vit. A I.U.	Thiamin mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic Acid mg.	Total[a] Standard Deviations>1
Mean Intake		5284	1.4	2.3	16.2	84.9	
J-01	14	3304	1.3	2.2	17.9	85.4	
J-02	13	1641	.9	1.4	14.7	47.0	5
J-03	5	3680	.9	1.9	12.7	29.2	3
J-04	17	3469	1.3	2.2	14.5	78.8	
J-05	5	6287	1.9	3.4	16.0	75.3	3
J-06	4	9139	1.3	3.2	8.7	118.4	5
J-07	8	3947	1.2	2.4	14.0	40.0	1
J-08	46	4033	1.3	2.3	17.8	78.3	
J-09	23	2677	1.2	1.9	14.5	65.8	1
J-10	11	3642	1.3	2.4	16.5	56.9	1
J-11	29	5399	1.2	2.1	19.0	92.1	
J-12	22	4898	1.4	1.8	15.8	85.8	
J-13	39	8286	1.4	2.2	20.7	73.4	1
J-50	13	4375	1.3	1.8	17.8	36.3	1
J-52	48	4982	1.3	2.2	18.0	91.9	
J-53	51	6889	1.4	2.4	17.4	101.0	
J-54	3	2379	0.8	1.6	10.9	106.1	4
J-55	18	5803	1.4	2.3	16.4	81.9	
J-56	17	4962	1.8	2.7	25.6	106.0	3
J-57	13	5918	1.7	2.6	18.7	99.4	
J-59	3	2624	1.3	2.0	14.9	82.8	2

[a]Figures underlined are more than one standard deviation from the mean for all census tracts.

TABLE 15--Continued

Census Tract	No. of subjects	Vit. A I.U.	Thiamin mg.	Ribo-flavin mg.	Niacin mg.	Ascorbic Acid mg.	Total Standard Deviations>1
J-63	1	3084	1.2	0.5	7.2	52.5	10
J-64	1	17364	0.8	1.6	15.1	156.8	5
J-65	5	4218	2.0	2.8	22.5	133.9	6
J-66	7	5519	1.5	2.2	18.2	56.7	2
J-67	35	3345	1.5	2.2	18.6	59.3	1
J-68	3	8178	1.4	2.7	16.4	83.2	4
L-17	2	6885	0.8	1.5	9.6	111.6	7
L-34	33	5459	1.3	2.1	14.5	73.1	
L-35	19	3802	1.0	1.8	11.2	76.8	5
DT-201	36	5991	1.5	2.6	17.2	97.2	
DT-202	9	3832	0.8	1.5	12.7	67.4	5
DT-203	1	12196	3.0	5.3	44.6	106.0	10
EL-38	9	8835	1.3	2.0	14.1	104.5	1
EL-39	6	3576	1.1	1.6	11.1	111.7	5
EL-40	4	8945	2.4	2.5	17.5	92.9	2
EL-43	11	6935	1.3	2.1	15.8	158.0	2
EL-44	4	4901	1.7	2.5	14.9	87.0	
MT-45	1	3635	1.9	4.2	10.8	79.5	7
MT-46	12	4820	1.4	2.3	16.9	99.6	
MT-47	9	3709	1.2	2.6	14.4	60.5	1
MT-48	15	4129	1.2	2.1	14.6	73.1	
MT-49	48	5204	1.6	2.7	16.4	121.4	1
MT-50	14	4866	2.1	3.1	22.4	95.1	7
DH-52	4	2498	1.2	2.3	14.0	46.1	2
DH-53	13	4257	1.3	2.4	15.1	73.7	
DH-54	42	5983	1.5	2.2	17.4	81.1	
DH-55	23	6830	1.5	2.3	15.7	91.4	
UT	215	4420	1.4	2.1	13.7	80.0	

On the other hand, in several census tracts there was an average caloric intake of over 2700 per day. One of these was J-11, which also had the largest black population of any census tract surveyed (see Figure 2, p. 29). Other areas in this category included part of Meridian Township, a high-income professional area, and a suburban area north of Jackson.

In terms of the nutrients which made up the total calories consumed by the subjects--fat, carbohydrate, and protein--the distribution of mean intakes of these can also be seen in Figure 4. As would be expected the areas of high and low consumption of fat and carbohydrate coincide generally with the areas of high and low caloric intake. Protein intake is a topic of great nutritional interest, as this is the body's only source of amino acids. It can be seen that there were many areas in which the average protein intake per subject was very high--100 grams per day and over--while there were relatively few areas where it was 80 grams or under per day. These latter areas tended to be concentrated in the northern section of Jackson, and in the Waverly School District.

<u>Minerals</u>

The spatial distribution of the daily mean intake of calcium and iron by the high school students in the study can be seen in Figure 5. Lower intakes of calcium by the teenagers tended to be clustered in urban Jackson and western suburban Jackson. Highest intakes of calcium were in the Meridian Township area, and in northern suburban Jackson, as well as three census tracts in central urban Jackson. Iron intakes,

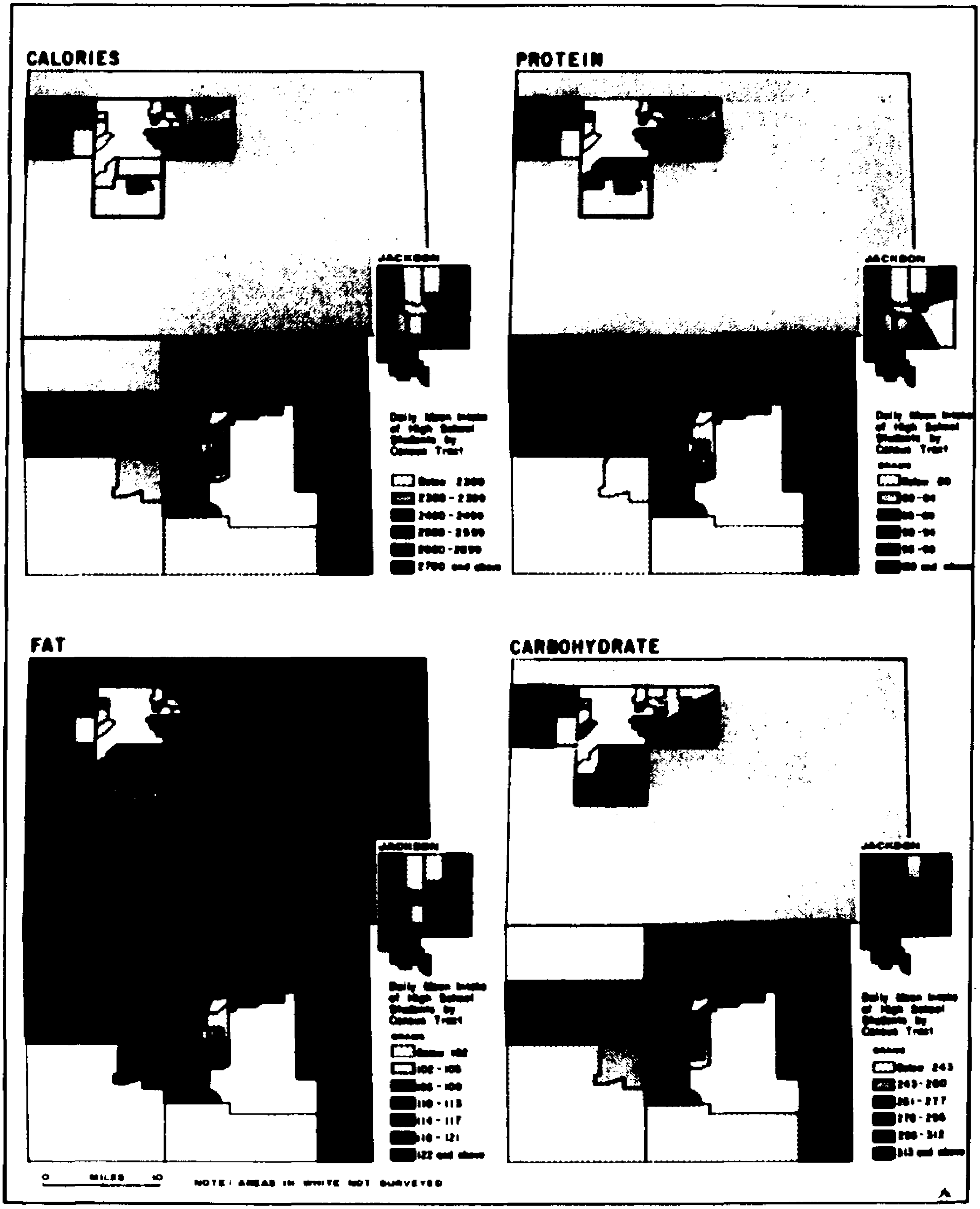

FIGURE 4

however, were high in rather random areas: some parts of Meridian Township, the Holt School District, northern suburban Jackson, and the census tract in Jackson containing the highest percentage of blacks.

Vitamins

The spatial distribution of the daily mean intake of vitamin A by the subjects in the study can also be seen in Figure 5. There are only a few census tracts with more than one person surveyed where the daily mean intake was over 7000 I.U., and these are in East Lansing, and urban Jackson. There are also only a few census tracts where the mean daily intake of vitamin A was 3000 I.U. or less, and these appear to be randomly scattered. In general, it can be said that the consumption of vitamin A does not seem to show distinct spatial patterns.

The three B vitamins considered in this study, thiamin, riboflavin, and niacin, show patterns rather similar to each other, as might be expected because in general they come from the same kinds of foods. The spatial distribution of the daily mean intake by the subjects in the study for these three vitamins can be seen in Figures 5 and 6. The intake of these three vitamins was highest in Meridian Township, and northern suburban Jackson. For thiamin, there was also a high intake area in the Holt School District. For each vitamin, there were scattered areas of high intake in urban Jackson, though they tend to differ from vitamin to vitamin.

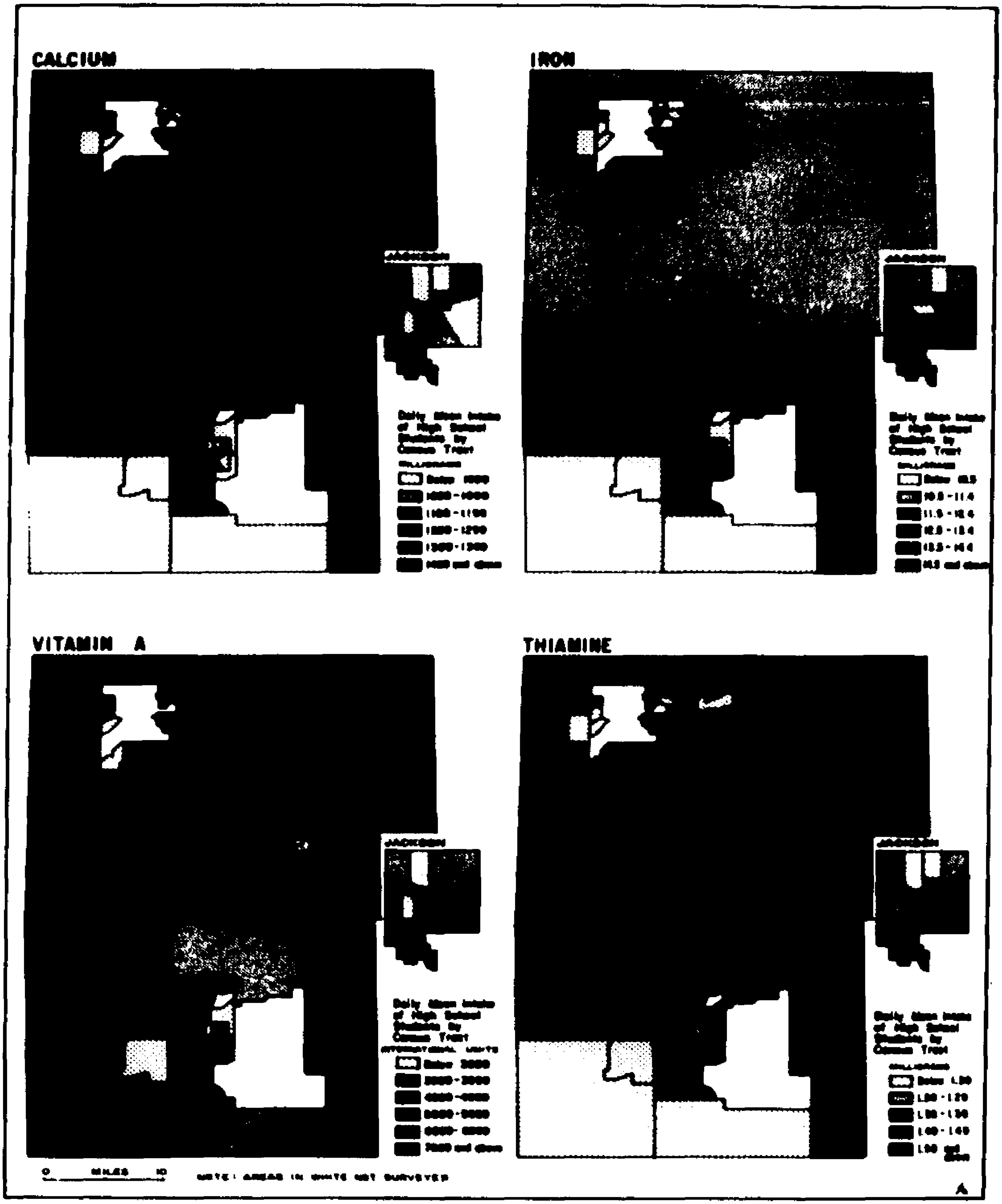

FIGURE 5

There is a very definite spatial pattern for daily mean intake of ascorbic acid by the subjects in the study as can be seen in Figure 6. In general, except for census tract J-06, the intake in urban Jackson was low. On the other hand, it was highest in East Lansing and Meridian Township, and also in some suburban areas of Jackson. It can also be seen from the histogram generated from the census tract averages for mean daily intake of ascorbic acid, Figure 7, that there is wide spatial variation in the consumption of this vitamin.

Frequency Counts

Table 15 (pp. 145-48) gives a frequency count of the number of times the average subject for each census tract was one standard deviation or more away from the census tract mean. Four of the census tracts, J-63, J-64, DT-203 and MT-45, which had a frequency count of 5 or more only contained one subject. However, several census tracts with a frequency count of 5 or more had several subjects in them, and so possibly merit further comment. In the city of Jackson, the frequency count for census tract J-02 was 5, and showed intakes for the average subject of one or more standard deviations below the census tract means for calcium, vitamin A, thiamin, riboflavin, and ascorbic acid. The residents of this census tract, according to the 1960 census figures had a median family income of between $5,000 and $6,000 per year, and the median school years completed for persons 25 years or older residing here was below 10. (See Figure 2, p. 29). The

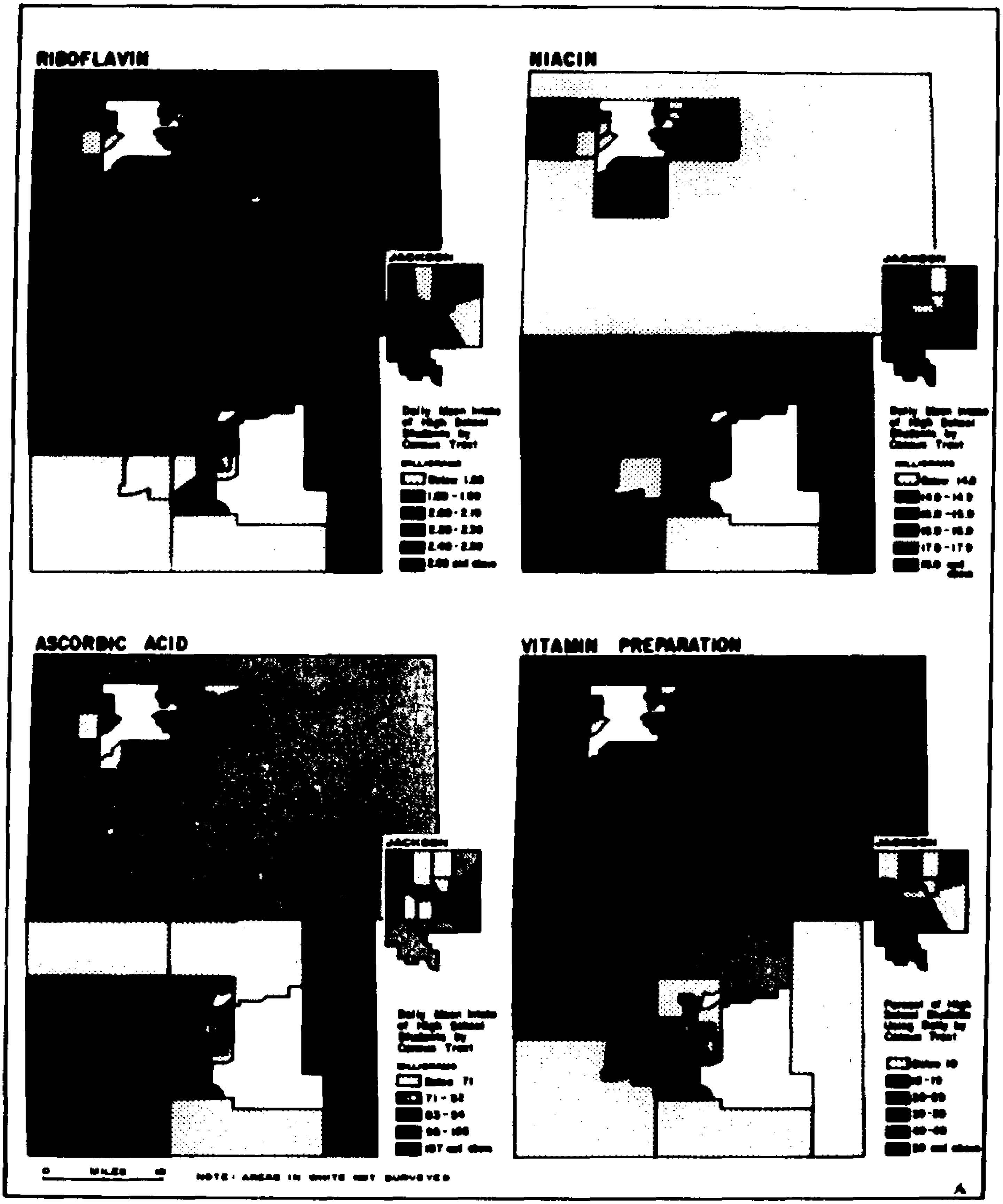
RIBOFLAVIN
NIACIN
ASCORBIC ACID
VITAMIN PREPARATION
NOTE: AREAS IN WHITE NOT SURVEYED

FIGURE 6

Histogram of Daily Mean Intake of Ascorbic Acid by High School Students by Census Tracts

```
SET    1            VARIABLE   17

          N =   49
       MEAN =       84,930
  STD, DEV. =       26,921    (       27,200)
   VARIANCE =      724,749    (      739,848)
COEF. OF VAR. =     31,698    (       32,026)
   SKEWNESS =         ,450    (         ,465)
   KURTOSIS =         ,617    (         ,818)

 LOWER QUARTILE =      72.255
         MEDIAN =      82.575
 UPPER QUARTILE =     100.242

   RANGE =     29,216 TO      157.9[illegible]
```

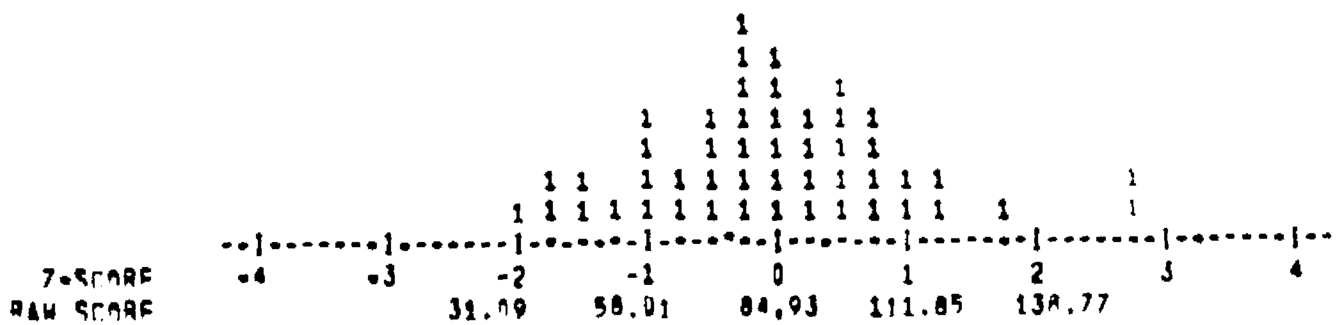

FIGURE 7

average resident of this census tract, then, is low on the socio-economic scale, and the subjects residing here had low intakes of several nutrients as well.

In the Waverly School District, where many of the wage-earners of the subjects' families were employed by the automobile industry, there were two census tracts, L-35 and DT-202 which showed frequency counts of 5. These census tracts contained 19 and 9 subjects respectively and in each case, the intakes of the nutrients falling one standard deviation or more away from the census tract average were below the average. For the average subject in census tract L-35, the low nutrients were calories, carbohydrate, iron, thiamin and niacin. In census tract D-202, they were also calories, carbohydrate and thiamin as well as calcium and riboflavin. According to the 1960 U.S. Census Data, the average residents in these census tracts fell into the same income range as did those in census tract J-02, and the median school years completed were 10 for residents of both tracts.

Census tract MT-50 is located in Meridian Township just outside the city of East Lansing. The Okemas High School is located in this census tract. Census tract MT-50 had a frequency count of 7, and contained 14 subjects in the study. In this case, each of the nutrients consumed in amounts differing one standard deviation or more from the census tract averages, were all consumed in amounts above the mean. These nutrients were calories, protein, carbohydrate, calcium, thiamin, riboflavin, and niacin. According to the 1960 U.S. Census figures, the median family income, and median years of schooling for residents of this census tract fall into the same range as for L-35 and D-202. This area, however, has experienced considerable recent residential expansion since 1960, and it might well be that the present figures for income and schooling would be higher.

Types of Food Consumed

In Chapter 3, a discussion was presented pertaining to the different types of food eaten by the total survey population such as servings of milk, vegetables, sugars and so on. Again, using census tract averages, histograms, frequency counts, maps, and simple correlations, the following analysis gives evidence that there was considerable spatial variation in terms of the kinds of foods consumed by the subjects surveyed.

Milk and Milk Products

Figure 8 shows the spatial distribution of the daily mean number of servings of milk and milk products by the subjects in the study by census tract. The mean number of servings per subject per census tract is 3.9, but there is obviously considerable variation. Lowest mean intakes by subjects occur in urban Jackson, and tend to coincide with those census tracts which had a higher proportion of black population (see Figure 2, p. 29). Another area of low consumption by teenagers, however, was in the Waverly School District, DT-202, where there were no black subjects. The highest areas of milk products consumption by tho subjects in the study also occurred in urban Jackson (J-05 and J-06), in East Lansing and Meridian Township, and also in the Waverly School District. Two other census tracts with high milk consumption averages for subjects occurred in suburban Jackson. These figures for consumption of milk products are given in Table 16, and also given are figures for the consumption of fresh fluid milk. In the case of the fresh fluid milk, the unit of measure is one cup, so the mean number of servings per student by census tract was 2.6 cups for the 24 hour period of the study. Again, by looking at the figures, it can be seen that there was a great deal of variation in the cups of milk consumed by students in the various census tracts, and that these figures tend to parallel those for total milk product consumption.

Simple correlations were done between consumption of the major food groups by census tract and some of the socio-economic factors determined by the 1960 U.S. Census Data. The U.S. Census Data variables chosen were those that the researcher thought might have some bearing on food habit and nutritional behavior of teenagers. The total list of variables considered is given in the Appendix in Table C1 (p. 344) along with the correlations significant at the 5% and 1% level.

For the entire Milk Products Group, there were three correlations significant at the 1% level. There was a positive correlation between the consumption of milk products, and the percentage of immigrants from the USSR in the census tract suggesting the positive influence of an ethnic group in terms of the subjects residing in this tract consuming more

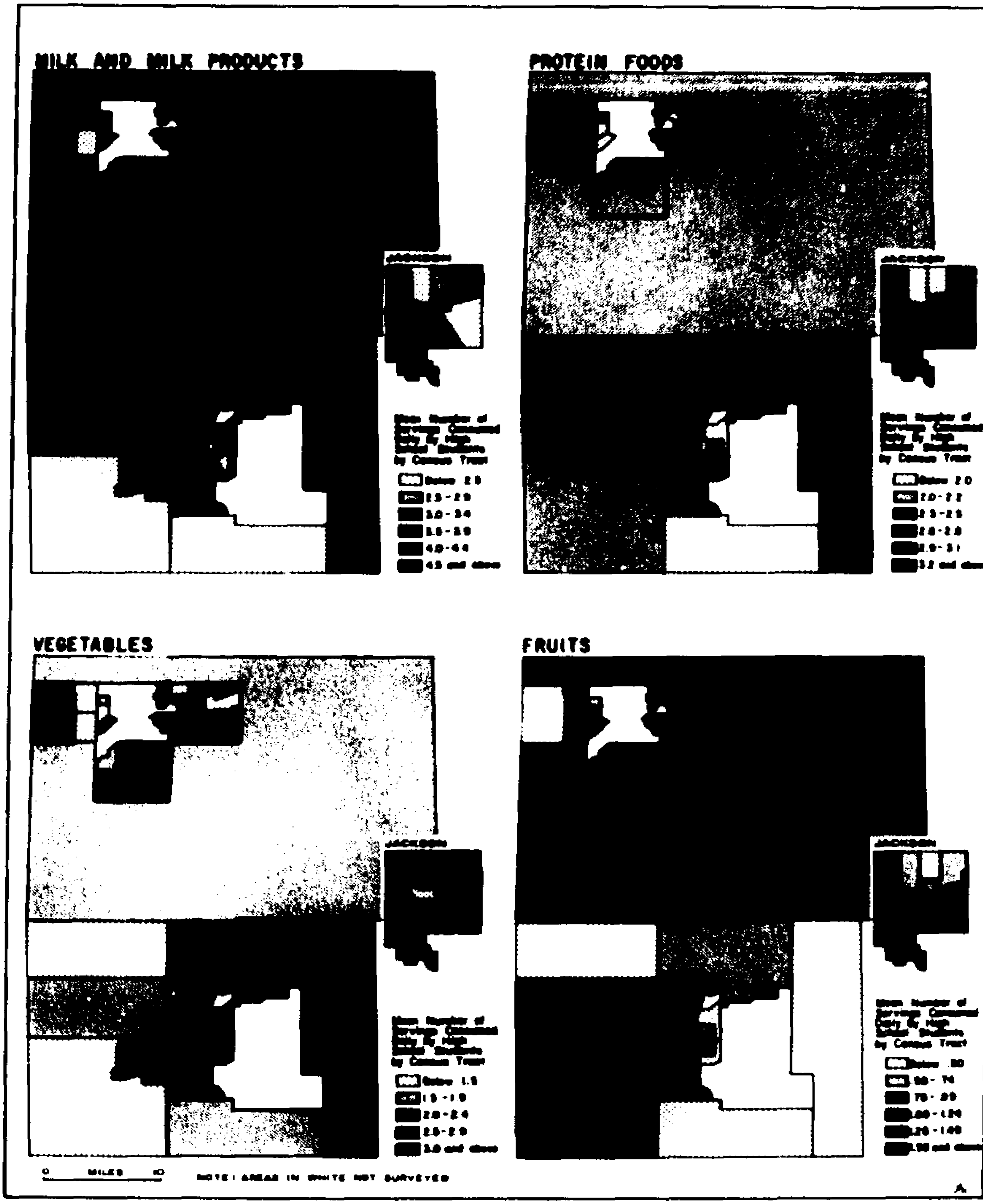
MILK AND MILK PRODUCTS
PROTEIN FOODS
VEGETABLES
FRUITS
JACKSON
0 MILES 10
NOTE: AREAS IN WHITE NOT SURVEYED

FIGURE 8

TABLE 16

Types of Foods Consumed in a Twenty-Four Hour Period:
Mean Number of Servings by Census Tract

	Milk	Protein Foods	Vegetables	Fruits	Grains	Fats	Sugar	Fresh Fluid Milk	Soft Drinks	Total Standard Deviations > 1 for Major Food Groups[a]
Mean number of servings	3.9	2.8	2.3	1.1	6.8	1.8	2.5	2.6	1.2	
Census Tract										
J-01	4.0	2.6	2.4	1.1	6.9	1.2	2.8	1.9	1.6	
J-02	1.9	1.8	3.4	0.6	7.1	0.6	4.1	1.4	1.9	3
J-03	3.0	1.3	4.3	0.1	6.5	0.8	4.0	2.4	1.5	4
J-04	4.3	2.6	2.8	0.7	8.2	1.5	3.0	2.6	1.9	
J-05	5.5	3.1	1.7	2.0	7.7	2.3	2.8	3.8	0.7	2
J-06	5.9	3.8	0.8	0.9	5.7	0.8	3.9	3.1	2.1	3
J-07	4.2	2.0	2.6	0.6	6.4	1.9	3.9	3.7	1.9	1
J-08	4.0	2.8	2.2	1.3	7.3	1.7	2.6	2.4	0.8	
J-09	2.6	3.6	1.6	0.7	6.9	1.4	4.1	1.8	1.8	2
J-10	3.5	3.2	2.5	0.7	8.0	1.1	2.7	2.5	0.6	
J-11	3.0	3.6	3.5	0.9	7.0	1.0	3.5	1.8	1.3	2
J-12	2.2	2.6	3.1	0.8	6.4	2.0	3.9	1.7	1.5	3
J-13	3.0	2.8	3.0	0.8	7.2	1.2	3.4	1.9	1.4	
J-50	2.6	2.6	2.0	0.3	6.8	2.7	1.6	1.8	0.9	1
J-52	3.5	2.7	2.8	1.4	8.1	1.6	2.6	2.5	1.0	
J-53	3.7	2.4	2.5	1.2	7.1	2.1	2.5	2.3	1.0	
J-54	3.0	2.0	2.3	3.8	4.9	0.2	2.1	1.9	2.1	2
J-55	3.5	3.1	2.3	0.8	7.9	1.3	2.7	2.3	1.7	
J-56	4.2	3.1	1.9	1.2	9.3	3.2	2.5	3.1	1.0	2
J-57	4.6	2.6	2.9	1.1	6.3	3.2	1.9	3.0	1.2	1

[a]Figures underlined are more than one standard deviation from the mean for all census tracts.

TABLE 16--Continued

Census Tract	Milk	Protein Foods	Vegetables	Fruits	Grains	Fats	Sugar	Fresh Fluid Milk	Soft Drinks	Total Standard Deviations >1 for Major Food Groups[a]
J-59	2.7	1.8	2.6	0.3	9.1	3.2	3.5	2.7	2.6	4
J-63	0.0	1.6	1.5	0.0	1.3	0.0	4.0	0.0	4.0	6
J-64	2.3	2.0	1.4	1.3	5.5	0.3	2.0	2.3	2.0	3
J-65	5.8	3.2	1.9	1.2	7.6	4.1	3.5	3.0	0.9	3
J-66	3.2	2.3	1.3	0.5	5.3	0.9	2.3	2.5	0.6	2
J-67	3.1	3.1	2.2	0.7	6.7	1.9	2.1	2.3	1.2	
J-68	4.2	2.6	3.3	0.3	10.6	0.7	4.5	3.8	0.2	4
L-17	3.0	0.0	2.3	1.8	6.0	0.0	2.3	2.0	1.3	3
L-34	3.7	2.1	1.7	0.6	5.7	2.7	2.1	2.6	1.0	
L-35	3.2	1.3	1.5	0.8	6.4	0.7	1.1	2.4	0.7	3
DT-201	4.5	2.5	1.4	0.8	5.7	2.6	1.5	3.7	0.8	2
DT-202	2.0	2.8	1.4	1.2	5.0	0.9	0.6	1.6	0.3	3
DT-203	10.8	12.4	5.0	0.0	17.3	8.0	5.0	4.0	3.0	7
EL-38	2.9	2.6	3.2	1.1	6.9	1.6	0.8	2.0	0.4	2
EL-39	2.5	1.5	1.7	1.4	4.0	1.3	1.2	1.8	0.0	2
EL-40	5.5	4.0	3.0	1.8	5.3	2.6	3.4	2.8	2.3	2
EL-43	4.1	2.5	2.6	2.7	4.7	1.9	1.2	2.0	0.2	3
EL-44	4.3	3.0	2.4	1.6	5.0	2.6	1.5	3.0	0.4	1
MT-45	11.0	3.9	0.0	0.8	3.1	0.0	1.0	7.0	0.0	5
MT-46	3.9	2.7	2.1	1.7	7.1	1.4	1.7	2.7	0.6	2
MT-47	5.0	2.8	2.6	1.2	5.2	1.4	1.1	3.6	0.4	1
MT-48	3.4	2.2	1.4	1.2	7.8	1.6	2.4	2.7	1.2	1
MT-49	4.5	2.9	2.0	1.7	7.1	1.6	2.1	3.3	0.8	1
MT-50	4.7	3.2	2.2	0.8	9.6	6.0	2.0	3.7	0.4	2
DH-52	3.8	2.3	1.7	1.4	7.6	1.0	2.6	2.8	1.8	
DH-53	3.8	2.7	3.4	1.0	5.7	1.8	2.2	2.8	1.5	1
DH-54	3.5	2.6	2.9	1.1	6.3	2.8	2.0	2.4	1.0	
DH-55	3.5	2.2	2.1	1.4	6.5	1.7	1.7	2.2	0.7	
UT	3.5	2.1	2.0	0.8	6.4	2.6	2.1	2.5	0.7	

milk and milk products. There was also a positive relationship with the amount of schooling the residents over 25 years of age in the census tract had had indicating a greater milk consumption by subjects in tracts whose residents had higher overall years of education. There was a negative relationship between the intake of milk products and the number of women in the census tract employed as operatives, indicating less milk product consumption by the teenagers in the study in the tracts where a higher percentage of these women resided.

There were several correlations significant at the 5% level. There was a positive relationship between milk product consumption and the percentage of immigrants in the census tract from Norway, Sweden and Czechoslovakia, but a negative relationship with the percentage from Poland. Again the presence of certain ethnic groups seemed to encourage milk product consumption by subjects in the study, while consumption of milk products was less frequent in areas where more Polish foreign stock resided. There was a positive relationship between milk products consumption and median family income indicating there was higher intake by subjects residing in tracts where the earning power was greater, but there was a negative relationship with the percentage of unemployed women residing in the census tract. In this case, lack of money may have restricted consumption. Several of the significant relationships dealt with the occupational categories of the men living in the census tract. There was a positive correlation with the percentage of men employed as professionals, managers, and salesmen, but a negative correlation with those employed as operatives or laborers. In other words, subjects residing in tracts with more men in positions usually thought of as economically better, had higher milk products consumption. Again, this might well be related to income. There was also a positive relationship with the percentage of women employed as professionals.

Correlations done between the consumption of fresh fluid milk and various 1960 U.S. Census Data variables indicate some of the same relationships but also some different ones. Significant at the 1% level are negative relationships between intake of milk and the percentage of unemployed men in the census tract as well as the percentage of women employed as craftsmen. The subjects in these tracts, then consumed less milk, and again, it could well be related to low income. At the 5% level there is a positive significant relationship between the percentage of whites residing in the census tract, and a negative relationship with the number of blacks. This is the same relationship that appeared between blacks and low milk intake when the socio-economic data gathered for this study was analyzed in Chapter 3. There is a positive correlation between milk drinking and the percentage of immigrants from Hungary who resided in the census tract, again suggesting an ethnic influence. Housing provides two significant relationships. There is a positive correlation between fluid milk consumption and the median number of rooms per housing unit, but a negative correlation with the percentage of persons per room in the housing unit being 0.50 or less. In other words, milk consumption was higher for subjects residing in tracts where the houses have more rooms, but was lower in tracts where the persons per room in housing units were relatively low.

Protein Foods

This group includes meat, fish, poultry, eggs, legumes, nuts and protein mixtures. As was seen in Chapter 3, the majority of the consumption in this group was from meat. Figure 8 (p. 159) shows the mean number of servings consumed daily by the teenage subjects by census tract. There is a core area of high consumption in urban Jackson. Other areas where consumption was high are in East Lansing and Meridian Township. These same areas also contain the tracts where protein food intake was the lowest: census tracts J-02 and J-03 in Jackson, with the adjacent J-59, and EL-39 in East Lansing. Also low in protein food consumption were the students in L-17 and L-35 in the Waverly School District.

Simple correlations were done between the number of servings of protein food consumed in the 24 hour period of the study per census tract, and the socio-economic variables from the 1960 U.S. Census Data indicated in Table C1 (p. 344). There were several correlations significant at the 5% level, and most of these indicate positive relationships between protein food intake and the percentage of black residents in the census tract, and negative relationships with white residents. In other words, subjects residing in tracts where there were a higher percentage of black people consumed less milk but more protein foods than did those residing in tracts with a higher percentage of white people. There was also a positive relationship between protein food consumption and the percentage of men in the census tract employed as laborers, indicating a pattern of higher protein food intake by subjects residing in tracts where a high percentage of these men lived. The reason for this would not be economic as protein foods tend to be expensive, and laborers are generally not in a high income category. In fact, concern is often expressed by those nutritionists working with low-income families that they spend too much of their food dollar for this type of food, and not enough for the other food groups. Instead, the explanation for such dietary patterns might well be that the eating of large quantities of meat was established as an important part of the diet by the families over the years, and these patterns are often slow to change.

Vegetables

The mean number of servings of vegetables per subject in each census tract was 2.3 for the 24 hour period of the study. Again, both from the map in Figure 8 (p. 159) and the figures in Table 16 (pp. 160-61), it can be seen that there was considerable variation from census tract to census tract. Furthermore, by a comparison of the Vegetable Map with the Milk and Protein Maps, it can be seen that a very different spatial picture emerges. For example, subjects in two of the census tracts in urban Jackson who ranked low in the consumption of both milk and protein foods, those in J-02 and J-03, were highest in the level of vegetable consumption, as were those in several other urban Jackson tracts. Other areas of high vegetable consumption by the teenagers included two tracts in East Lansing and one in the Holt School District. Low vegetable consumption by the students in the study was found in just one urban Jackson tract, but in several tracts in the Waverly School District and in parts of Meridian Township.

Simple correlations were done between the number of servings of foods in the Vegetable Group consumed by the subjects by census tract during the 24 hour period of the study, and the socio-economic variables derived from the 1960 U.S. Census Tract Data. There were several correlations significant at the 1% level. There were positive correlations between the number of servings of vegetables consumed and the percentage of blacks residing in the census tract, the number of unemployed men and women in the census tract, the percentage of deteriorated housing in the census tract, and the percentage of males employed as private household and service workers. All of these socio-economic variables are usually related to a less favorable economic status. In other words, subjects residing in tracts with a high percentage of blacks, of unemployed people, of men employed as private household or service workers, or with a high percentage of deteriorating housing consumed more vegetables. Perhaps there was an economic reason for this, as certain vegetables cost considerably less than meat or milk, for example. It also could have been related as well to the food patterns established by the family in past years. There was a negative relationship shown between the intake of vegetables and the percentage of whites residing in the census tract, indicating a lower consumption by subjects in tracts where there were more white people.

At the 5% level, there was a negative correlation between number of servings of vegetables consumed and the number of years of schooling of residents 25 years and older. This indicated that those subjects who lived in tracts where the residents had more schooling consumed fewer servings of vegetables, perhaps again indicating established family food patterns. There was a positive relationship between vegetable intake by the subjects residing in a tract and the percentage of women in the tract employed as craftsmen and operatives, but a negative relationship with women employed in clerical work. These figures are presented in Table C1 (p. 344).

Fruits

Fruits were not consumed in large quantities by many of the subjects in the study. The mean number of servings consumed in each census tract was only 1.1 for the 24 hour period of the study. A rather definite spatial picture emerges, however, when these fruit consumption figures are mapped, as can be seen in Figure 8 (p. 159). The subjects in most of the tracts in urban Jackson consumed an average of less than one serving of fruit for the 24 hour period studied, while the subjects in most tracts in East Lansing and Meridian Township consumed an average of more than one serving per day.

It was shown in Chapter 3 that there were positive correlations, significant at the 1% level, between consumption of fruit and both the years of education of the father, and the father's occupation as a professional person. It is interesting, therefore, to visually compare the map for Fruit in Figure 8 (p. 159), and maps for Father's Level of Education and Father's Occupation-Professional in Figure 9 (p. 169). The darker and lighter areas in all three maps are very similar, indicating a like pattern for these three variables.

These relationships are further borne out by the 1960 U.S. Census Data. Simple correlations were done between the mean number of servings of fruit for the subjects by census tract with the several socio-economic variables listed in Table C1 (p.344). Significant at the 1% level were positive correlations between fruit consumption and the median years of schooling of residents of the census tract 25 years and older, and the percent of males in the tract employed as professionals as well as managers and salesmen, and female professionals, again indicating the same relationships discussed above. There was also a positive relationship between fruit consumption and the percentage of immigrants in the tract coming from Austria, the USSR, and Canada. In other words, subjects residing in tracts where there were higher percentages of foreign stock from these countries consumed more fruit, again suggesting ethnic influence. There was a positive correlation between fruit consumption and income, but a negative correlation with the percentage of unemployed men and women residing in the census tract. Fruit is often considered to be an expensive item and therefore it is not

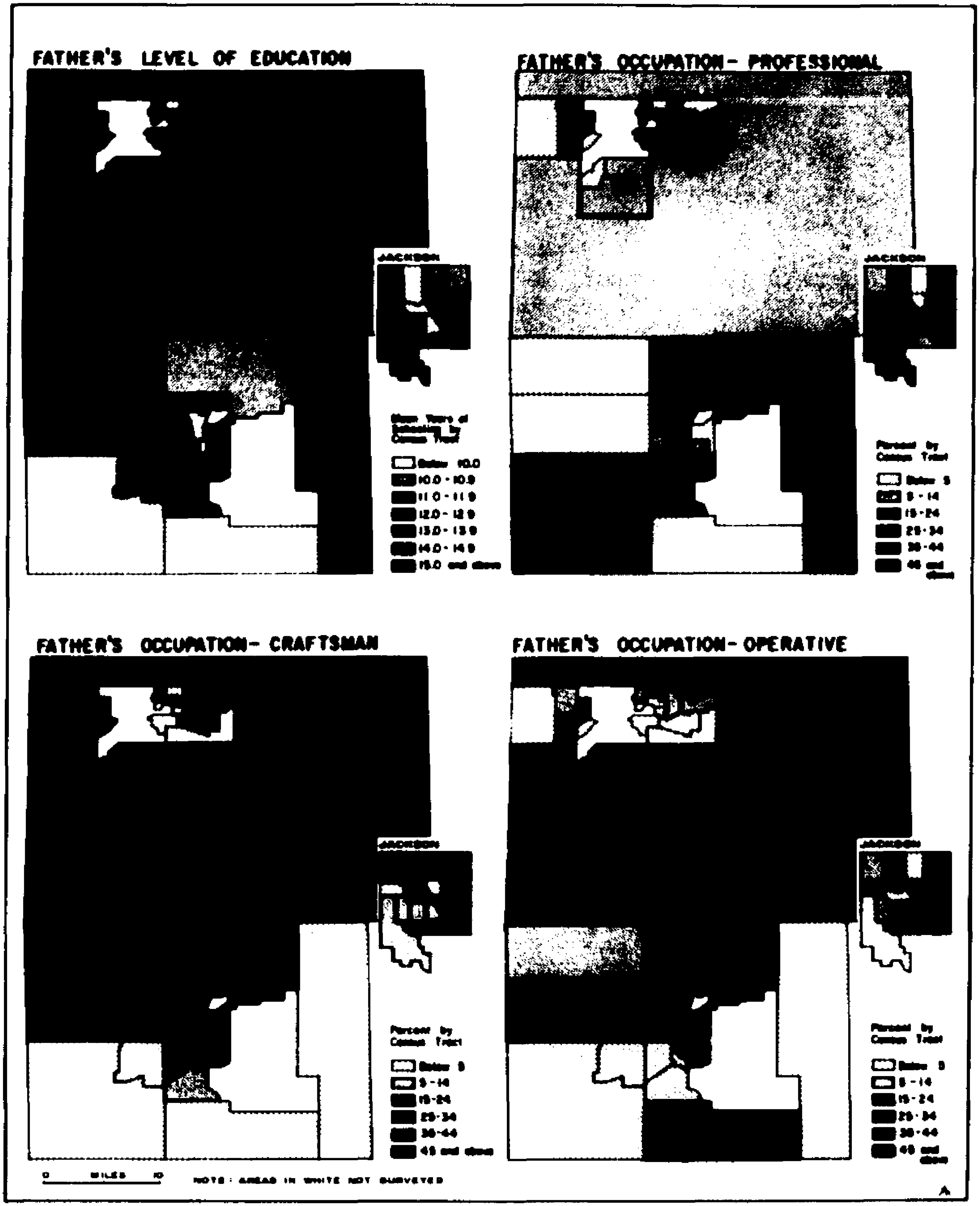
FATHER'S LEVEL OF EDUCATION
10.0 - 10.9
11.0 - 11.9
12.0 - 12.9
13.0 - 13.9
14.0 - 14.9
FATHER'S OCCUPATION- PROFESSIONAL
FATHER'S OCCUPATION- CRAFTSMAN
FATHER'S OCCUPATION- OPERATIVE

FIGURE 9

surprising that subjects who resided in tracts where income was lower, or the percentage of unemployed persons higher, ate less fruit. Also negative were the relationships between fruit consumption and the percentage of men employed as craftsmen and operatives, and females employed as operatives. Again this might well be related to money available to be spent for food. Finally, positive relationships were shown between fruit consumption and sound housing, and negative relationships between fruit consumption and deteriorating housing. Thus, subjects residing in tracts with a higher percentage of sound housing--another economic indicator--ate more fruit, while subjects in tracts with more deteriorating housing ate less.

Grain

The mean daily intake by census tract for grain products was 6.8 servings for the high school students surveyed in the study. As detailed in Chapter 3, this food group includes breads, cereals, flours, pastas, and baked goods. Areas of highest grain products consumption can be seen on the map in Figure 10, to be one tract in Meridian Township plus a few in suburban Jackson. Areas of lowest intake by the subjects fall in western suburban Jackson, the city of East Lansing, Meridian Township, and the Waverly School District. The one area where several tracts together had a low mean intake by the teenagers would be the one in East Lansing. The subjects in urban Jackson showed a very consistent median intake of grain products.

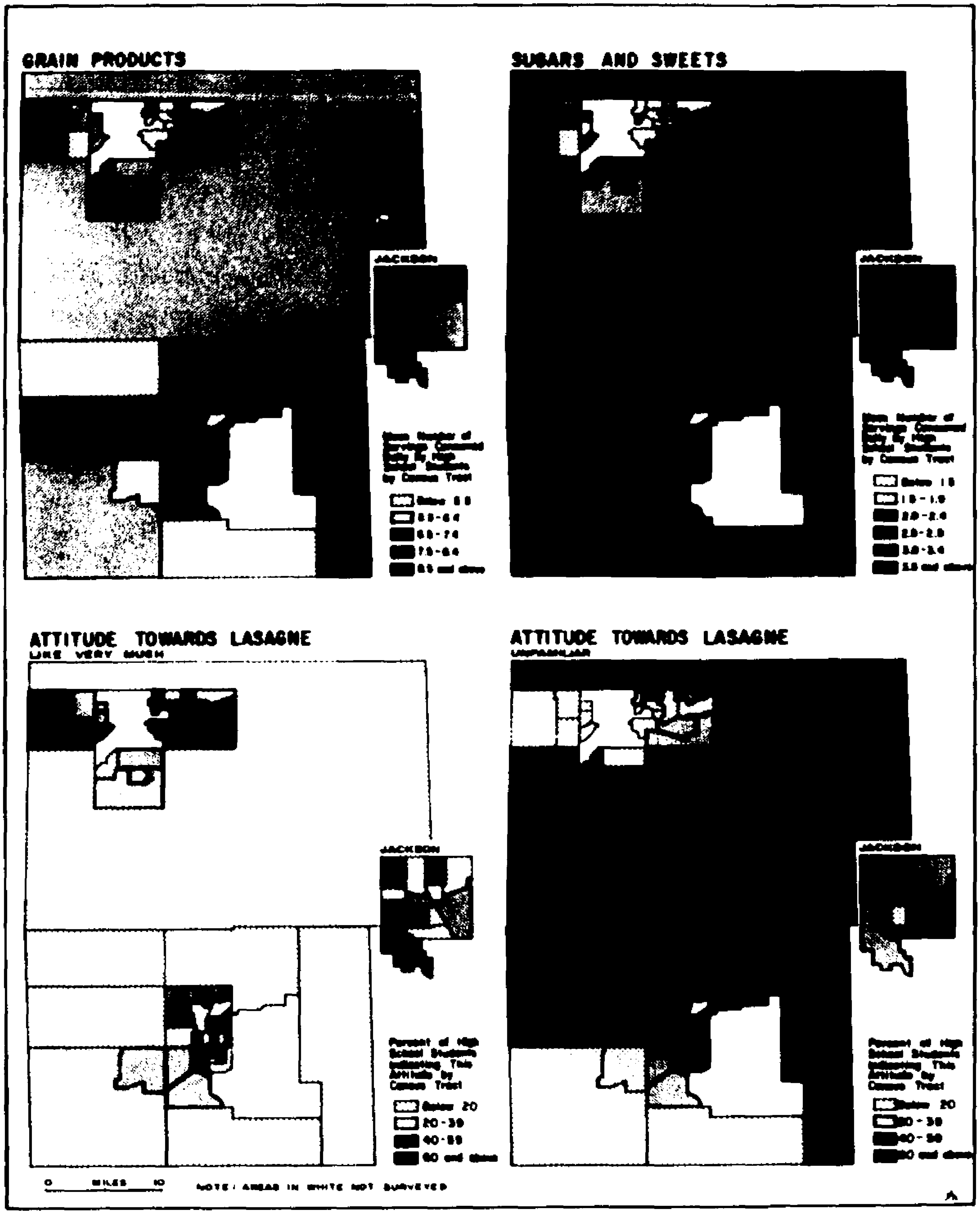
GRAIN PRODUCTS
SUGARS AND SWEETS
ATTITUDE TOWARDS LASAGNE
ATTITUDE TOWARDS LASAGNE

FIGURE 10

Simple correlations were done between the consumption of grain products by the subjects in each census tract, and socio-economic variables given by the 1960 U.S. Census Data. (Table C1, p. 344). Only one correlation was significant and that at the 5% level. It indicated a positive relationship between the number of servings of grain products consumed in the 24 hour period of the study by the subjects and the number of women residing in the census tract who were employed in managerial positions.

Fats

The mean daily intake of fats by census tract for the high school students in the study was 1.8 servings, or tablespoons. That there was some variation from census tract to census tract in this intake can be seen from the figures in Table 16 (pp. 160-61) as well as the histogram in Figure 11. The census tracts with the highest fat consumption, 3.2 servings or more, were clustered together in suburban Jackson (J-56, J-57, J-59, and J-65) with an additional very high intake by the subjects in MT-50. The area of lowest intake, excluding those tracts with only one or two subjects was J-54, where the subjects had an average intake of only 0.2 servings. In general, however, the number of servings of fat consumed did not vary greatly from census tract to census tract. Total fat consumption in grams by census tracts is shown in Figure 4 (p. 150).

Simple correlations were carried out between the mean number of servings of fat for each subject in each census

Histogram of Daily Mean Number of Servings of Fats and Oils Consumed by High School Students by Census Tracts


```
SET    1          VARIABLE   45

          N =    49
       MEAN =         1,823
  STD, DEV. =         1,425   (        1,440)
   VARIANCE =         2,032   (        2,074)
COEF. OF VAR. =      78,196   (       79,006)
   SKEWNESS =         2,093   (        2,160)
   KURTOSIS =         6,255   (        7,076)

 LOWER QUANTILE =          .972
         MEDIAN =         1.556
 UPPER QUANTILE =         2.553

   RANGE =        0,000 TO        8,000
```

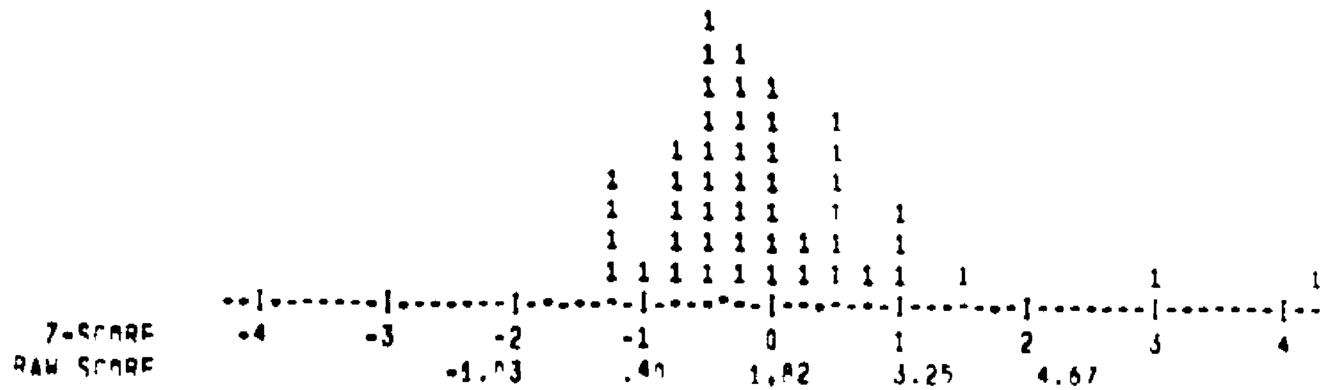

FIGURE 11

tract, and socio-economic variables determined from the 1960 U.S. Census Data for each census tract. There were several significant at the 5% level. There were positive relationships between fat consumption by the subjects in the tract and the average population per household, the percentage of men in the census tract employed as clerical workers, and the median persons per room in each household unit. Negative relationships were indicated between fat intake and the percentage of renters in the census tract who were white, and also the percentage of occupied units with 0.50 persons per room or less. Thus, subjects from tracts with a higher percentage of white renters or a lower density of population per household consumed fewer servings of fatty foods.

Sugars and Sweets

The mean daily intake of sugars and sweets by census tract for the high school students in the study was 2.5 servings. The map in Figure 10, demonstrates that there was considerable variation from tract to tract. Furthermore, a very definite pattern emerged. The subjects in the entire urban area of Jackson plus much of the suburban area consumed higher amounts of sugar and sweets than did those in the East Lansing and Meridian Township areas. Included in the group Sugars and Sweets were soft drinks, and it can be seen from the figures in Table 16 (pp. 160-61) that there was also considerable variation in the consumption of these beverages from tract to tract. This variation tends to parallel the figures for the larger group, Sugars and Sweets.

Concern has been expressed by many nutritionists about the amount of carbonated beverages consumed by teenagers because of their low nutritive, but high caloric value. The evidence presented here indicates that not all teenagers are drinking large quantities of soft drinks, but rather that their consumption is spatially varied, with much more drinking in the urban areas.

Again, simple correlations were carried out between the number of servings of sugars and sweets consumed by high school students by census tracts, and certain socio-economic variables derived from the 1960 U.S. Census Data (Table C1 p. 344). In this case, numerous relationships were shown to exist, presenting a rather different picture than in the case of Grain Products, for example. Significant at the 1% level are positive correlations between the amount of sugars and sweets consumed and the percentage of black persons residing in the census tract, the percentage of both unemployed males and females in the tract, and the percent of men employed as laborers. Again, this might well be related to income, as sugar is an inexpensive source of energy, and the groups mentioned are those who are often less well off economically. There was also a positive correlation between sugar consumption and the percentage of immigrants from the United Kingdom, Ireland, and Poland. In other words, subjects from tracts with a higher percentage of foreign stock from the United Kingdom, Ireland, and Poland consumed more servings of sugars and sweets in the 24 hour period recalled in the study. That this might well be ethnic influence in at least the case of the United Kingdom is borne out by the fact that there is a higher consumption of sugar per capita in that country than in the United States.[1] There was a negative relationship between intake of sugar and the percentage of white residents in the tract, the population per household, and the median years of schooling of residents of the tract over 25 years of age. As would be expected from correlations given previously, subjects from tracts where there was a greater percentage of white people residing consumed fewer sugars and sweets. This lower consumption was also true of subjects from tracts where the residents had more years of education, and where the population per household was higher.

Sugar consumption also appeared to be related to housing. For example, there was a positive relationship between the intake of sugar and the percentage of housing in the tract classified as deteriorating, and also with the median number of persons per room per unit. Subjects from tracts where there was more deteriorating housing and more crowded living conditions, then, consumed more sugars and sweets. This, again, might well be related to income. There was a negative relationship between sugar consumption and the median number of rooms per housing unit, indicating a lower sugar intake by those subjects in tracts where the housing units were bigger.

---

[1]Magnus Pyke, Man and Food. (McGraw Hill: New York, 1970, p. 83.

Significant at the 5% level were positive correlations between sugar intake and the percentage of foreign stock in the tract, and also the percentage of males employed as service workers. There were negative relationships indicated between sugar consumption and the percentage of immigrants residing in the tract from the USSR indicating perhaps less emphasis on sugar intake by this particular group. There was also a negative correlation between sugar consumption of the subjects and the percentage of housing units designated as sound in the tract where they resided.

Simple correlations were also carried out between the consumption of soft drinks specifically and the same socio-economic variables. It can be seen from Table C1 (p. 344) that many of the significant correlations are the same as for the larger group of Sugars and Sweets. Certain other relationships should be noted, however. For example, there is a negative correlation, significant at the 1% level between soft drink consumption, and the percentage of men employed as professionals and as managers, while there is a positive correlation with the percentage of men employed as operatives and service workers. This positive correlation is significant at the 5% level with respect to craftsmen and laborers also. It is interesting to compare this information with the socio-economic data gathered in the present study. For example, Figure 9 (p. 169) has mapped the percentage of fathers in the study employed as professionals by census tract, and also the father's level of education. It can be seen that in general, the areas of more mean years of education and the greater percentage of employment as professionals are the same areas that are lower in soft drink consumption. This concurs with both the correlations for U.S. Census Data, and for the socio-economic data gathered in this study. On the other hand, where the number of fathers employed as operatives or craftsmen was high, consumption of soft drinks by the subjects tended to be high also.

Frequency Count

There was variation from tract to tract in the deviation from the mean number of servings consumed of the different food groups by the teenagers in the study. Table 16 (pp. 160-61) gives a frequency count by census tract of the number of times the average number of servings consumed by subjects in each census tract was one standard deviation or more away from the census tract mean. There were seven major food groups considered, and so the following discussion is limited to those tracts showing a frequency count of at least three. Five of these census tracts: J-63, J-64, L-17, DT-203 and MT-45, had only one or two subjects in them. Census tracts J-02, J-12, J-03 are similar in that the average subject in each reported a high consumption of both vegetables and sugar. The teenagers in J-02 and J-12 indicated a low consumption of milk, however, while those in J-03 had a low protein food intake plus a low fruit intake. The subjects in J-06 showed high sugar consumption but also high milk consumption, with low intakes of vegetables. In J-59 and J-65 in suburban Jackson, the subjects reported high fat and high sugar intakes.

In J-65 there was also high milk consumption. In J-59 there was high grain consumption but a low intake of fruit. The subjects in J-68 also indicated a high sugar intake, with a high consumption of grain products and vegetables as well. Fruit consumption was low.

The teenagers in census tracts L-35 and DT-202 in the Waverly School District reported low sugar and vegetable intakes, as well as low amounts of protein foods for those in L-35 and low milk for those in DT-202. All intakes appear to be lower than many other sections of the total survey area. In EL-43, the intake of sugar by subjects was also low as was grain consumption, but fruit intake was high.

While it is difficult to make generalizations concerning these differences, this information certainly reinforces the concept put forth that spatial variation does exist in the food habits of teenagers with respect to the types of foods that they eat.

Calories and Protein from Meals and Snacks

The mean consumption by the teenagers of their total day's calories from meals by census tract was 79% in the study, while 21% of their calories were consumed in the form of snacks. For protein, however, the figures were 88% and 12%, thus indicating that the snack foods eaten provided more of the day's calorie supply than they did of the more critical nutrient. Figures in Table 17 give these percentages by census tract, and again it can be seen that there is considerable variation among the different tracts. The

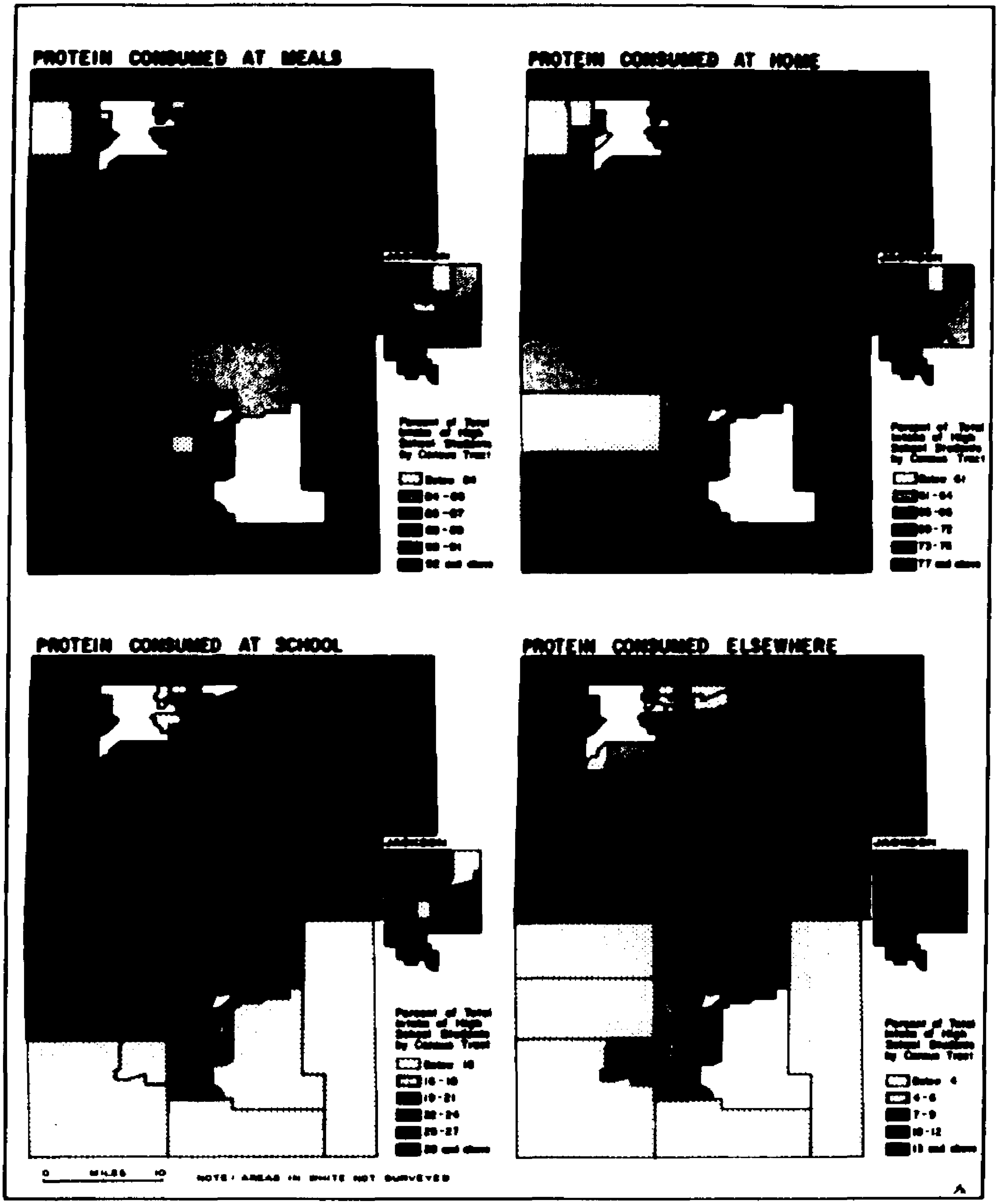
PROTEIN CONSUMED AT MEALS
PROTEIN CONSUMED AT HOME
PROTEIN CONSUMED AT SCHOOL
PROTEIN CONSUMED ELSEWHERE
NOTE: AREAS IN WHITE NOT SURVEYED

FIGURE 12

TABLE 17

Calories and Protein Consumed from Meals and Snacks, and at Home, School, or Elsewhere: Mean Percentages by Census Tract

	Calories from		Protein from		Calories Consumed			Protein Consumed		
	Meals	Snacks	Meals	Snacks	at Home	at School	Elsewhere	at Home	at School	Elsewhere
Mean Percent	79	21	88	12	66	23	10	70	22	8
Census Tract										
J-01	80	20	91	9	62	26	13	68	24	8
J-02	68	32	84	16	63	21	15	65	22	13
J-03	67	33	80	20	62	20	18	72	21	7
J-04	73	27	85	15	68	13	19	79	10	10
J-05	83	17	92	8	68	18	14	74	18	8
J-06	69	31	83	17	61	17	22	62	20	18
J-07	76	24	85	15	60	28	12	67	27	7
J-08	79	21	87	13	63	28	9	67	24	9
J-09	77	23	87	13	66	20	13	73	16	11
J-10	84	16	91	9	71	18	12	75	15	10
J-11	76	24	85	15	59	28	12	61	27	12
J-12	77	23	87	13	58	26	17	63	26	11
J-13	82	18	87	13	58	32	10	62	30	8
J-50	82	18	89	11	66	25	9	71	21	7
J-52	81	19	89	11	66	26	8	68	24	9
J-53	80	20	88	12	71	22	7	74	21	5
J-54	86	14	92	8	79	10	11	84	6	11
J-55	74	26	81	19	62	20	17	69	20	11
J-56	79	21	89	11	60	32	9	61	32	6
J-57	78	22	87	13	60	31	9	65	26	9
J-59	67	33	89	11	63	20	17	70	23	7
J-63	74	26	96	4	100	0	0	100	0	0

TABLE 17--Continued

	Calories from		Protein from		Calories Consumed			Protein Consumed		
	Meals	Snacks	Meals	Snacks	at Home	at School	Elsewhere	at Home	at School	Elsewhere
J-64	50	50	89	11	73	8	18	85	13	3
J-65	78	22	89	11	51	40	10	59	38	4
J-66	82	18	91	9	63	33	4	64	34	3
J-67	80	20	85	15	69	19	13	71	20	10
J-68	80	20	92	8	87	13	0	88	12	0
L-17	84	16	91	9	62	33	4	56	37	7
L-34	77	23	82	18	62	27	11	61	29	10
L-35	82	18	88	12	59	26	14	62	25	13
DT-201	82	18	87	13	59	33	8	58	34	7
DT-202	80	20	84	16	62	29	8	61	31	8
DT-203	80	20	82	18	53	27	20	52	29	18
EL-38	83	17	86	14	70	15	16	76	12	12
EL-39	78	22	85	15	70	27	4	78	21	1
EL-40	96	4	98	2	93	4	3	96	4	0
EL-43	81	19	89	11	77	21	2	76	23	1
EL-44	80	20	89	11	67	14	19	71	15	14
MT-45	84	16	80	20	84	16	0	85	15	0
MT-46	83	17	89	11	70	22	8	71	21	9
MT-47	79	21	87	13	60	32	8	65	32	4
MT-48	77	23	87	13	68	25	7	72	25	3
MT-49	79	21	86	14	67	23	10	69	22	9
MT-50	78	22	85	15	68	23	8	74	21	5
DH-52	78	22	91	9	76	24	0	79	21	0
DH-53	82	18	93	7	65	25	10	68	25	7
DH-54	83	17	90	10	62	27	11	64	26	10
DH-55	80	20	90	10	66	26	8	69	24	7
UT	84	16	90	10	68	23	9	71	22	8

percentage of protein consumed at meals is shown mapped in Figure 12. In some clusters of tracts, the protein consumption from meals by the subjects residing there was below the mean figure of 88%. This can be noted, for example, in urban Jackson, where the figures for all but three tracts fall below the mean, and also in Meridian Township and the Waverly School District. In each of these instances, snacks were contributing significantly to the protein intake of the subjects, and even more substantially to their calorie intake. In general, it can be seen that the figures for protein parallel those for calories, but run about 10% higher. On the other hand, the subjects in rural Jackson and Ingham Counties consumed more of their protein--and calories--at meals.

Simple correlations were run between the percentages of calories and protein obtained from meals and snacks, and the socio-economic variables determined from the 1960 U.S. Census Data. The only significant positive correlation appeared between the percentage of calories obtained from meals, and the median years of schooling for the residents in the tract over 25 years. Subjects residing in tracts where residents had more schooling, then, obtained more of their calories from meals. There were negative correlations, also significant at the 5% level, between percentage calories consumed at meals and the percent of immigrants from Poland residing in the census tract, indicating fewer calories consumed at meals and more from snacks by these subjects again perhaps because of the influence of ethnic eating patterns. There was also a negative relationship between the percentage of deteriorating housing units in the tract and the percentage of calories consumed at meals by the subjects residing in the tract. This suggests housing conditions which were not conducive to meals but rather encouraged snacking.

Calories and Protein Consumed at Home, School and Elsewhere

The mean consumption of the subjects' total day's calories by census tract was 66% at home, 23% at school and 10% elsewhere. For protein, the figures were 70% at home, 22% at school and 8% elsewhere. Thus the major consumption of both calories and protein was at home, with about one-quarter of the day's total intake of both being consumed at school, and roughly 10% elsewhere. These figures are given for the different census tracts in Table 17 (pp. 181-82), and are also mapped for protein consumption in Figure 12 (p. 180). It can be seen that the figures for protein and calories tend to be quite similar, tract by tract, but that the percentage of protein consumed at home is always a little higher than the percentage of calories. In this respect, subjects in all areas seemed very consistent. There were areas, however, where the percentage of protein consumed by the teenagers at home was somewhat lower than the mean, particularly the Waverly School District, and urban and northern suburban Jackson. On the other hand, the East Lansing and Okemos subjects tended to consume more protein at home and less at school and elsewhere. It might be surmised that eating lunch at school, whether it was purchased or brought from home, was more important in general to subjects in the Waverly School

District, and much of urban and northern suburban Jackson (Northwest High School) than it was for those in East Lansing and Okemos, and in rural Ingham and southern Jackson counties.

Simple correlations run between the percentage of calories and protein consumed in different places and the various socio-economic variables extracted from the 1960 U.S. Census Data show a variety of relationships. There was a positive correlation, significant at the 1% level, between the percentage of calories consumed at home and the percentage of both men and women in the tract employed as professional people. Thus, subjects who resided in tracts where there was a high percentage of people employed in professional occupations ate more of their calories at home. There was also a positive relationship, significant at the 5% level between the percentage of immigrants in the tract from Norway, Sweden and Canada and the percentage of calories consumed at home, but a negative correlation with the percentage from Poland. This suggests that family eating patterns established by the first three groups of foreign stock emphasized eating at home, while exactly the reverse was true for the Polish immigrants. There was also a significant positive correlation with the median years of schooling of persons in the tract over 25 years of age, and with median family income. Thus, teenagers in the study from tracts where education and income levels were higher ate more calories at home. There were negative correlations, significant at the 5% level, between percentage of calories consumed at home, and the number of men in the tract employed as craftsmen and the number of both men and women employed as operatives. Subjects from tracts with higher percentages of persons in these occupational categories consumed fewer calories at home, then. It can be seen from the figures in Table C2 (p. 350) that the correlations for the percentage of protein consumed at home were similar in nature.

For the percentage of calories consumed at school, there were several correlations significant at the 5% level. There was a negative relationship with the percentage of immigrants from Mexico and Canada residing in the tract indicating that subjects from census tracts where a higher percentage of foreign stock from these countries resided ate fewer calories at school. There was also a negative correlation between the percentage of rental housing units in the tract occupied by whites and the percentage of calories consumed by subjects from these tracts at school. There was a positive relationship with the population per household, the percentage of males in the tract employed as craftsmen and the median number of rooms per housing unit. In other words, subjects from tracts where there were more people per household, more males employed as craftsmen, or more rooms per housing unit, ate more calories at school than did other groups. Again, the correlations for percentage of protein consumed at school are similar, as can be seen in Table C2 (p. 350).

Calories and Protein Consumed Alone or With Others

The total calorie and protein intake of each subject was subdivided, on a percentage basis, into four categories, depending on with whom it was eaten: alone, with the entire family, with some of the family, or with friends. These percentages were then averaged by census tracts, and the results are presented in Table 18. The percentages for protein consumption are also mapped in Figure 13. From these it can be seen, for the period of the study, that different eating patterns existed in different areas. For example, in some areas, one-quarter or more of the protein consumed was consumed when the subject was eating alone. These areas would include large parts of East Lansing and Meridian Township, part of the Waverly School District, and a few tracts in Jackson. On the other hand, subjects in suburban Jackson, for the most part, ate considerably less protein alone. Again, the figures for calorie consumption parallel rather closely those for protein consumption.

Eating with the entire family together is often felt to be a disappearing phenomenon in the American society. On the basis of this study, it can be said to still exist, but on a varying basis. In urban Jackson, except for tract J-10, less than one-quarter of the protein eaten by the subjects in the study was consumed with the entire family. This was also true in the Waverly School District, except for tract L-17. On the other hand, subjects in rural Ingham County, East Lansing, Okemos, and most of suburban Jackson consumed higher percentages of their protein with the family.

Some of the family eating together was an important pattern for most of the subjects in urban Jackson and some of the subjects in suburban Jackson and the Holt School District.

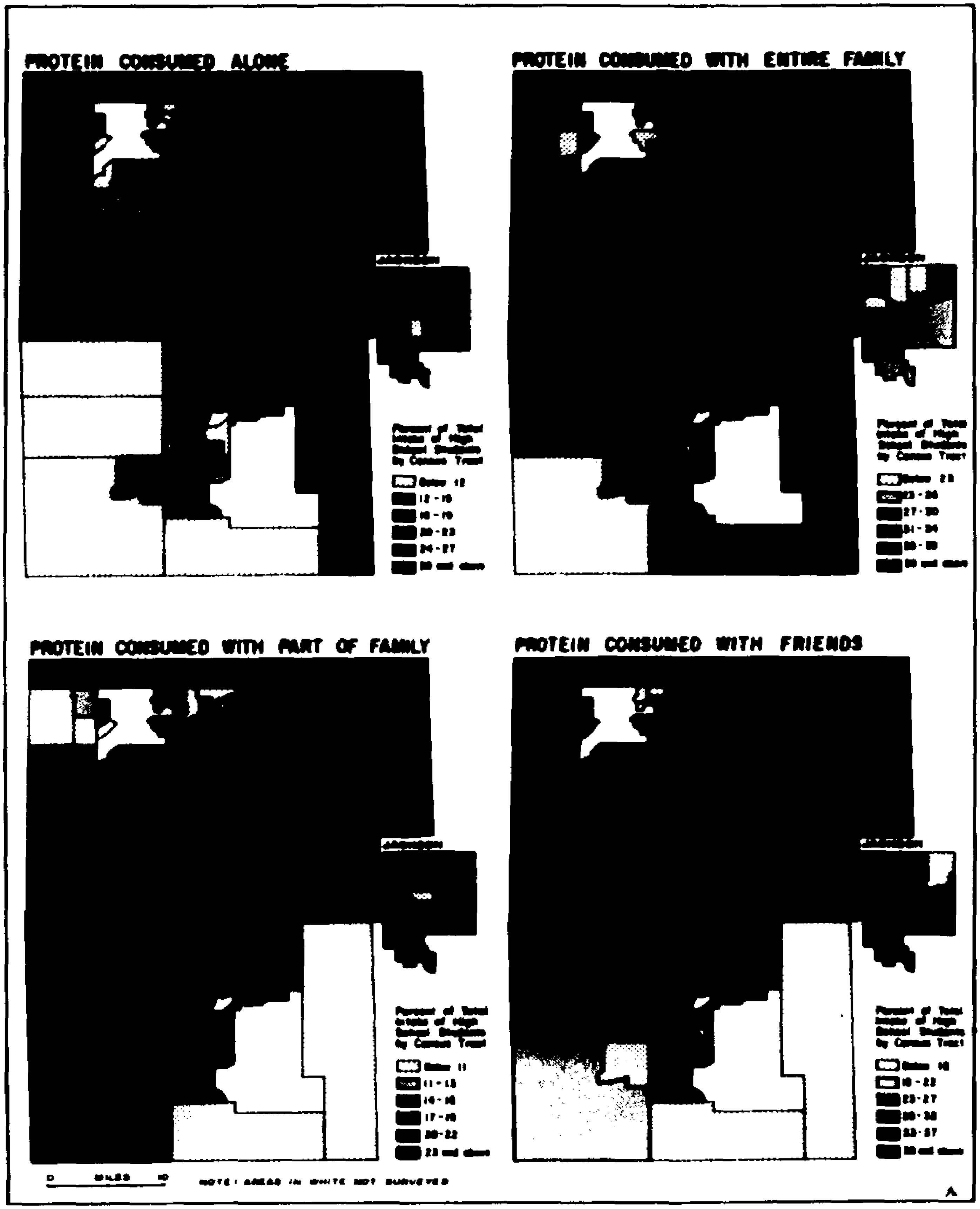
PROTEIN CONSUMED ALONE
PROTEIN CONSUMED WITH ENTIRE FAMILY
PROTEIN CONSUMED WITH PART OF FAMILY
PROTEIN CONSUMED WITH FRIENDS
0 MILES 10
NOTE: AREAS IN WHITE NOT SURVEYED

FIGURE 13

TABLE 18

Calories and Protein Consumed Alone, and With the Entire Family, With Some of the Family, and With Friends: Mean Percentage by Census Tract

	Calories Consumed				Protein Consumed			
	Alone	With Entire Family	With Some of Family	With Friends	Alone	With Entire Family	With Some of Family	With Friends
Mean %	22	28	17	32	19	33	18	29
Census Tract								
J-01	24	20	21	35	22	25	22	31
J-02	27	6	25	41	21	5	33	40
J-03	25	15	25	35	23	15	34	28
J-04	26	22	22	31	26	30	27	17
J-05	30	19	18	32	28	20	24	26
J-06	24	30	5	41	26	29	6	39
J-07	31	20	14	36	33	26	11	30
J-08	22	20	23	35	18	26	25	31
J-09	31	20	20	29	28	24	24	23
J-10	8	55	13	24	5	61	14	19
J-11	21	26	15	38	17	29	26	15
J-12	21	20	13	46	19	24	16	42
J-13	26	22	13	39	24	25	15	36
J-50	18	37	12	33	13	45	14	29
J-52	22	25	20	33	19	30	20	31
J-53	23	31	19	27	18	38	19	25
J-54	31	36	12	21	36	34	13	16
J-55	17	32	15	37	12	39	17	32
J-56	25	21	14	40	23	26	13	39
J-57	20	28	21	32	20	32	22	26
J-59	12	35	17	37	9	48	14	30
J-63	35	65	0	0	4	96	0	0
J-64	0	0	67	33	0	0	81	19

TABLE 18--Continued

	Calories Consumed: Alone	Calories Consumed: With Entire Family	Calories Consumed: With Some of Family	Calories Consumed: With Friends	Protein Consumed: Alone	Protein Consumed: With Entire Family	Protein Consumed: With Some of Family	Protein Consumed: With Friends
J-65	14	25	17	44	7	34	19	39
J-66	6	29	26	38	5	33	26	37
J-67	20	34	17	28	18	37	18	26
J-68	32	37	13	19	24	52	9	15
L-17	10	48	4	38	5	51	0	44
L-34	27	22	16	35	26	24	15	35
L-35	19	21	22	39	14	26	22	37
DT-201	27	24	13	36	24	26	13	37
DT-202	27	23	10	40	25	23	11	42
DT-203	26	27	0	48	17	36	0	48
EL-38	22	38	18	21	21	45	19	16
EL-39	8	33	21	38	10	38	22	30
EL-40	34	37	17	12	36	37	17	10
EL-43	33	34	12	21	26	41	11	21
EL-44	40	12	27	21	42	11	28	19
MT-45	0	67	16	16	0	65	20	15
MT-46	36	29	10	25	36	32	10	23
MT-47	20	30	12	37	18	35	10	36
MT-48	24	33	11	32	22	38	12	28
MT-49	27	23	20	29	25	27	21	28
MT-50	28	31	12	29	25	36	14	26
DH-52	14	33	29	24	5	40	35	21
DH-53	26	23	16	34	23	27	18	32
DH-54	25	24	15	35	23	27	17	32
DH-55	16	24	27	32	15	31	25	29
UT	22	33	14	31	20	38	14	28

Also important in protein consumption was the percentage eaten with friends for teenagers in the study in several tracts in urban Jackson. The tracts that showed the highest percentage of protein eaten with friends are in general those that are highest in percentage of black residents according to the 1960 U.S. Census Data (see Figure 2, p. 29). The Waverly School District, and areas of suburban Jackson, where there was no black population, also had high percentages of these subjects, however.

Simple correlations were run between the percentage of calories and protein consumed by the subjects alone or with various groups, and the socio-economic variables derived from the 1960 U.S. Census Data. These are given in Table C3, p. 356. For calories consumed alone, there were several correlations significant at the 5% level. These included positive relationships with the percentage of immigrants residing in the tract from Austria and Hungary, the median years of schooling of those in the tract 25 years of age or older, and the percentage of women employed as clerks. There were negative correlations between the percentage of calories consumed alone and the percentage of men employed as laborers, and men and women employed as operatives. These same relationships existed in general with the percentage of protein consumed alone. Thus, subjects residing in census tracts where there was a higher median level of education ate more calories alone. This was also true of subjects from tracts with a higher percentage of people from Austria or Hungary, or a higher percentage of women employed in clerical work. On the other hand, teenagers in the study from tracts where there were higher percentages of men employed as laborers and men and women employed as operatives ate a smaller percentage of the total calories alone.

Few correlations were significant in terms of the percentage of total calories and protein consumed by the subjects with either the entire family or part of the family and socio-economic variables. There was a negative correlation, significant at the 5% level, between the percentage of calories consumed with the entire family and the percentage of foreign-born stock in the census tract indicating that subjects from tracts with a higher percentage of immigrants ate a smaller percentage of their calories with the entire family.

There were, however, many significant correlations between the percentages of protein and calories consumed by the teenagers in the study with their friends and the various census tract variables. There was a positive correlation, significant at the 1% level, between the percentage of calories consumed with friends, and the percentage of immigrants in the tract from Poland, but a negative correlation with the percentage of immigrants from Norway, Sweden, and Canada. These relationships were exactly the opposite from those already noted and discussed with respect to the percentage of calories consumed at home for these same ethnic groups. A positive correlation existed also with the percentage of unemployed males residing in the tract, indicating that subjects from these tracts ate more calories with friends. Subjects from tracts where the percentage of men employed as craftsmen, and men and women employed as operatives residing in the census tracts was higher also consumed a higher percentage of their calories with friends. Negative correlations existed between the percentage of calories consumed by the subjects with friends and the median years of schooling of residents of the tract 25 years of age and older, with the percentage of men and women employed as professionals, and also with men employed as salesmen. In each of these instances then, the higher the percentage of people from these groups there were in the tract, the lower the percentage of calories the subjects from these tracts consumed with friends.

At the 5% level, there were significant positive correlations between percentage of calories consumed by the teenagers in the study with friends and the percentage of housing units owned by blacks as well as the percentage of deteriorating housing units in the tract. There were significant negative relationships with median family income for the tract, and the percentage of men employed as managers. In other words, subjects from tracts where family income was higher as well as those from tracts where the percentage of men employed as managers was higher ate a smaller percentage of their calories with friends. It can be seen from Table C3 (p. 356) that the correlations for percent protein consumed with friends were quite similar.

Who Purchases Food for the Family?

In the past, the mother of the family has traditionally been the one who did the purchasing and the preparation of food for the entire family. That this was still true for the subjects covered in this study is evident by the fact that the mean percentage of mothers by census tract who were listed as major food purchasers for the family was 73.5%. However, when this figure is examined spatially, it can be seen from Figure 14 that there is considerable variation from tract to tract. In Meridian Township and some areas of suburban Jackson, the mother was almost entirely responsible for food purchasing. However, in areas of East Lansing and urban Jackson in particular, less than 70% of the mothers were listed as the major food purchaser for the family. A more detailed look at these census tracts might well provide insight into this aspect of food habits. Those census tracts with only one or two subjects in them will be excluded (J-63, J-64, L-17, DT-203, MT-45).

Table 19 shows the categories for major food purchaser other than Mother alone for those census tracts where Mother alone accounted for less than 70% of the major food purchasing. It can be seen that a variety of patterns emerge. In census tracts J-03, J-04, and J-07, a large part of the responsibility for food purchasing was carried out by either the mother and father together, or the father alone. This same pattern appears in suburban Jackson as well in J-50, J-55, J-59 and J-65. One other area showed the same type of response, and that was composed of two tracts in East Lansing: EL-38 and EL-44. In other areas of urban Jackson, J-11, J-12 and J-13, and also J-67 and DH-55, a much more varied response emerged. In these areas, the major responsibility for food purchasing was divided in several different ways. These

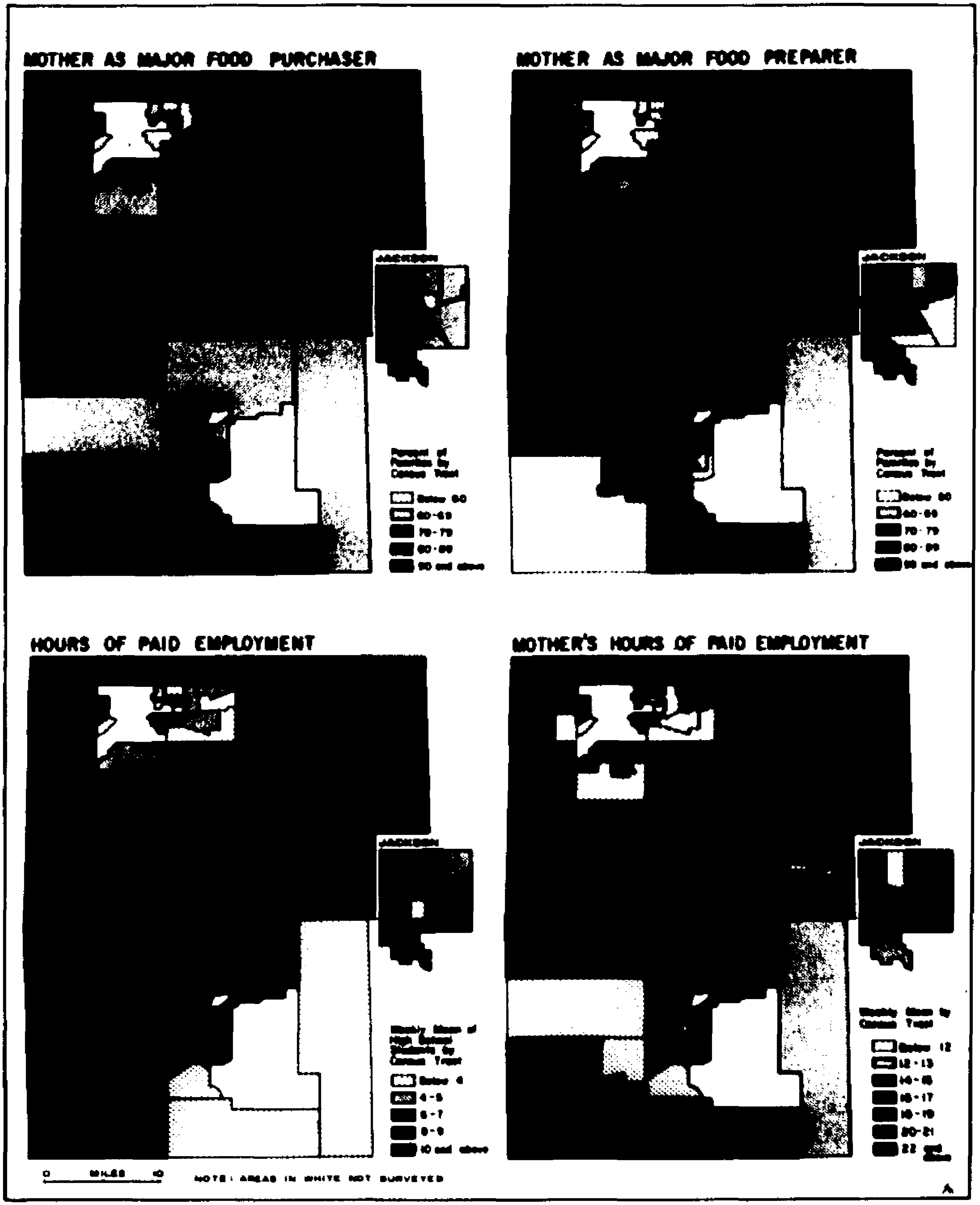
MOTHER AS MAJOR FOOD PURCHASER
MOTHER AS MAJOR FOOD PREPARER
HOURS OF PAID EMPLOYMENT
MOTHER'S HOURS OF PAID EMPLOYMENT
Below 60
60-69
70-79
80-89
90 and above
Below 4
4-5
6-7
8-9
10 and above
Below 12
12-13
14-15
16-17
18-19
20-21
22 and above
0 MILES 10
NOTE: AREAS IN WHITE NOT SURVEYED

FIGURE 14

TABLE 19

Major Purchasers of Food: Percentages From Selected Census Tracts

Census Tract	Mother & Subject	Mother, Subject & Others	Mother & Father	Father	Subject	Subject & Others Except Mother	Other
J-03			20	20			
J-04			35				
J-07			13	38			
J-11	07		03	10		07	10
J-12	05		14	14	05		
J-13	03		06	10	10		05
J-50			08	23			
J-55			22	11			
J-59			33				
J-65			20	20			
J-67		03	11	11	03	03	
EL-38			22	15			
EL-44			50				
MT-46			17	08		08	08
DH-55	04		13	09	04		09

included Mother and Subject, Mother, Subject, and Other Family Members, Subject Alone, Subject and Other Family Members Except Mother, and finally Others Outside the Immediate Family.

Thus, although Mother is still the major food purchaser in the majority of cases, a great deal of the responsibility seemed to be assumed by the father of the family in certain areas, and by a variety of family members in other areas.

Who Prepares Food for the Family?

As with food purchasing, food preparation has traditionally been the role of the mother in the family. That this was still true for the subjects covered in this study is evidenced by the fact that the mean percentage by census tract of subjects who listed their mother as the major food preparer was 71.4%. Again, however, it can be seen from Figure 14 that there were several areas where Mother was listed as the major food preparer by less than 60% of the subjects. These areas included two tracts in urban Jackson (J-12 and J-13) plus the adjacent suburban tract (J-50), several tracts in the East Lansing area (EL-38, EL-39, EL-44 and MT-45) and tract L-17. On the other hand, there were several tracts, seemingly randomly dispersed, where Mother was the major food preparer in 90% or more of the families surveyed. Those having more than one or two subjects in them include MT-49 in the Okemos area, J-05 in urban Jackson, and J-56 in northern suburban Jackson.

If mother was not the major preparer of food in the family, then who did do it? Figures are given in Table 20 for those census tracts where 30% or more of the subjects listed some category other than Mother alone. It can be seen that many of the census tracts included are the same as those given in Table 19.

However, in general, the range of responses recorded was much wider. When Mother alone was not the major food preparer, Mother and Father together were listed in some of the census tracts, and Father alone in many of them. Other categories given which were involved frequently and accounted for a considerable percentage of responses included the Subject, either alone or with other family members.

Attitude Towards A Selected Food--Lasagne

In chapter 3, a tabulation was given (Table 9, p. 111) of the responses of the total survey population indicating their feelings towards a wide variety of foods. The subjects could indicate either liking or disliking the food, being neutral about it or being unfamiliar with it. Some foods elicited a wide variety of responses while others, such as pizza and milk, were liked by almost the entire group.

In this section, an effort is made to analyze the responses given to a single food over space. The food chosen was lasagne, and the reason for the choice is that not only was there a wide variety of feelings about this food, but many of the subjects indicated complete unfamiliarity with it. Two of the response categories are presented spatially in

TABLE 20

Major Preparers of Food: Percentages From Selected Census Tracts

Census Tract	Mother & Subject	Mother, Subject & Others	Mother & Father	Father	Subject	Subject & Others Except Mother	Other
J-03			20				20
J-12	14	05		09	09		05
J-13	10			03	10	03	18
J-50	23	15			08		
J-55	06		22		06		06
J-59				33			
EL-38	22			11	11		
EL-39	33	17			17		
EL-43	27			09			
EL-44		25					25
L-35	05		05	11	11		05
DT-201	06	03	06	06	06	03	14

Figure 10 (p. 171). These maps indicate the percentage of subjects by census tract who liked lasagne very much, and those who were unfamiliar with it. Very definite patterns emerged. Those census tracts where 40% or more of the subjects indicated that they liked lasagne very much are almost all in the East Lansing-Okemos area. On the other hand, those census tracts where 40% or more of the subjects responded that they were unfamiliar with lasagne included much of urban and suburban Jackson as well as rural Ingham County. Table 21 lists the responses in all possible categories by census tracts. It is interesting to note that although they were offered the choice "Neither like nor dislike" very few of the census tracts had a high percentage response in this category. If the subjects knew what the food was, most of them had definite opinions about liking it or disliking it. And many more liked this particular food than disliked it.

A knowledge of a food such as lasagne could be said to indicate a certain sophistication about foods. Certainly the areas where lasagne was liked the best were the East Lansing-Okemos areas where median family income and years of schooling were also high. The areas where "Unfamiliar with" was the most prevalent response were the areas of lowest median family income and median years of schooling. That these spatial patterns are quite comparable can be seen by comparing the Lasagne Maps (Figure 10, p. 171) with Figures 2 (p. 29) and 9 (p. 169). Again this would support the hypothesis that spatial variation does exist in food habits, and

TABLE 21

Attitude Towards Lasagne: Percentage of Subjects Responding by Census Tract

Census Tract	Like Very Much	Like Slightly	Neither Like Nor Dislike	Dislike Slightly	Dislike Very Much	Unfamiliar with
J-01	20	20	0	0	07	53
J-02	08	08	08	0	0	77
J-03	20	20	0	20	20	20
J-04	12	24	29	0	0	35
J-05	0	40	20	0	20	20
J-06	25	25	0	0	0	50
J-07	0	0	25	0	0	75
J-08	47	16	09	02	02	24
J-09	43	09	0	04	0	43
J-10	60	20	0	0	10	10
J-11	10	07	10	07	14	52
J-12	23	05	14	05	0	55
J-13	13	10	08	08	05	56
J-50	15	15	08	08	0	54
J-52	26	13	15	02	13	32
J-53	33	12	12	02	02	39
J-54	33	67	0	0	0	0
J-55	17	06	06	06	06	61
J-56	21	16	11	0	11	42
J-57	0	36	0	0	0	64
J-59	33	0	33	0	0	33
J-63	0	0	100	0	0	0
J-64	0	100	0	0	0	0
J-65	0	0	0	0	0	100

TABLE 21--Continued

Census Tract	Like Very Much	Like Slightly	Neither Like Nor Dislike	Dislike Slightly	Dislike Very Much	Unfamiliar with
J-66	0	0	14	0	29	57
J-67	09	11	09	0	03	69
J-68	0	0	0	33	0	67
L-17	50	50	0	0	0	0
L-34	24	24	24	18	09	0
L-35	21	26	16	16	11	11
DT-201	36	19	19	08	06	11
DT-202	44	33	0	11	11	0
DT-203	100	0	0	0	0	0
EL-38	67	11	0	0	0	22
EL-39	50	33	0	0	0	17
EL-40	100	0	0	0	0	0
EL-43	64	18	0	0	09	09
EL-44	50	25	25	0	0	0
MT-45	0	0	0	0	0	100
MT-46	42	17	08	0	17	17
MT-47	11	11	22	22	0	33
MT-48	53	07	20	07	0	13
MT-49	41	10	12	10	06	20
MT-50	43	14	21	0	0	21
DH-52	0	0	0	0	0	100
DH-53	38	23	23	0	0	15
DH-54	31	12	07	02	07	40
DH-55	35	09	04	0	04	48
UT	17	12	10	05	07	49

furthermore, that if food habits do need to be changed to improve nutritional status, then the basis for change can vary considerably over space. An effective program of nutrition education would undoubtedly need to take this into consideration. It could be assumed that if reactions to a food other than lasagne were analyzed for spatial variation, a different pattern of responses would have been elicited.

City Block Data

As was pointed out in Chapter 2, the U.S. Census Bureau had made certain information on housing available for the city blocks in the thirteen census tracts comprising urban Jackson (J-01 to J-13). As each subject had listed his residence, those in the city of Jackson were coded as to the city block in which they lived. They were then assigned the housing data for that city block, and simple correlations were carried out between these housing variables and certain of the variables from the study on food habits and nutritional characteristics. There were a total of 211 subjects residing in the city of Jackson. The housing variables are listed in the Appendix in Table D1 (p. 367). These are self-explanatory for the most part. However, the U.S. Census Bureau gives the following explanation for condition of housing:

> Condition and plumbing.--Data are presented on condition and plumbing facilities in combination. The categories represent various levels of housing quality. To measure condition, the enumerator classified each housing unit in one of three categories: Sound, deteriorating, or dilapidated. Plumbing facilities were measured in terms of water supply, toilet and bathing facilities.

Condition.--The enumerator determined the condition of the housing unit by observation, on the basis of specified criteria. Nevertheless, the application of these criteria involved some judgment on the part of the individual enumerator. The training program for enumerators was designed to minimize differences in judgment.

Sound housing is defined as that which has no defects, or only slight defects which are normally corrected during the course of regular maintenance. Examples of slight defects include: lack of paint, slight damage to porch or steps; small cracks in walls, plaster, or chimney; broken gutters or downspouts; slight wear on floors or doorsills.

Deteriorating housing needs more repair than would be provided in the course of regular maintenance. It has one or more defects of an intermediate nature that must be corrected if the unit is to continue to provide safe and adequate shelter. Examples of intermediate defects include: shaky or unsafe porch or steps; open cracks, or missing materials over a small area of the floors, walls, or roof; rotted window sills or frames; deep wear on stairs, floors, or doorsills; broken or loose stair treads or missing balusters. Such defects are signs of neglect which lead to serious structural deterioration or damage if not corrected.

Dilapidated housing does not provide safe and adequate shelter. It has one or more critical defects; or has a combination of intermediate defects in sufficient number to require extensive repair or rebuilding; or is of inadequate original construction. Critical defects result from continued neglect or indicate serious damage to the structure. Examples of critical defects include: holes, open cracks or missing materials over a large area of the floors, walls, roof, or other parts of the structure; sagging floors, walls, or roof; damage by storm or fire. Inadequate original construction includes structures built of makeshift materials and inadequately converted cellars, sheds, or garages not originally intended as living quarters.

Plumbing.--The category "With all plumbing facilities" consists of units which have hot and cold piped water inside the structure, and flush toilet and bathtub (or shower) inside the structure for the exclusive use of the occupants of the unit. Equipment is for exclusive use when it is used only by the persons in the one housing unit, including any lodgers living in the unit.

The category "Lacking some or all facilities" consists of units which do not have all the plumbing facilities specified above. Units without hot water, toilet, or bathtub (or shower) are included in this category. Also included are units whose occupants share toilet or bathing facilities with the occupants of another housing unit.

The category "Lacking some or all facilities--with flush toilet" consists of units which do not have all plumbing facilities but do have a flush toilet inside the structure. The toilet may be for the exclusive use of the occupants of the unit or shared with the occupants of another housing unit.

The category "Lacking some or all facilities--no flush toilet" consists of units for which there is no flush toilet available in the structure. These units may lack other plumbing facilities also.[2]

Types of Food Eaten

Simple correlations were carried out between the U.S. Census City Block variables and the number of servings of the various types of food consumed by the subjects living in Jackson. The results are presented in Table D1 (p. 367). There were no significant correlations between housing variables and the consumption of foods in the Milk and Milk Products Group. There was a positive correlation, significant at the 5% level, between number of servings consumed of the Protein Foods Group, and the percentage of housing units occupied by blacks. This agrees with results found for the census tract data as well as for the total survey population.

---

[2]U.S. Bureau of the Census. U.S. Census of Housing: 1960. Vol. III, p. X.

There was a positive correlation, significant at the 5% level between number of servings of the Vegetable Group consumed, and the percentage of sound housing units lacking some or all plumbing facilities. Thus subjects residing in city blocks with a higher percentage of housing of this type consumed more vegetables. This might be accounted for by consumption of inexpensive vegetable foods requiring little in the way of preparation with water such as potato chips or canned vegetables. No significant correlations were found between city block housing data and consumption of fruits. Although many significant relationships were noted earlier between the intake of fruit and various socio-economic and cultural variables, housing does not seem to be an important one.

In the Grain Products Group, there were two positive correlations significant at the 5% level. These indicated a relationship between the number of servings of foods in the Grain Products Group and the percentage of sound housing units with all plumbing facilities, and also with the percentage of housing units with 1.00 or less persons per room. Thus, subjects from city blocks with these more favorable types of housing consumed more grain foods.

For the Fat Group, there were several correlations significant at the 5% level. There were positive correlations between number of servings of foods from the Fat Group and percentage of total sound housing units, the percentage of units that were occupied by their owners, and the percentage of units occupied by whites. Negative correlations existed between the number of servings of fatty foods and the percentage of deteriorating housing units and the percentage of dilapidated housing units as well as the percentage of units occupied by renters. This would indicate a higher consumption of fatty foods by those people generally considered to be in a more favorable economic situation with respect to housing: living in sound units, owners, and white.

A positive correlation, significant at the 5% level existed between number of servings consumed in the Sugars and Sweets Group and the percentage of sound housing units lacking some or all plumbing facilities. Thus, teenagers in the study from city blocks where the percentage of this type of housing was higher consumed more sugars and sweets as well as vegetables.

Consumption of Protein and Calories

There was a negative correlation significant at the 5% level between the percentage of calories consumed at meals by the teenagers in the study and the percentage of housing units occupied by renters. There was a positive correlation, however, between the percentage of calories consumed with the entire family and these renters. There was a negative correlation between the percentage of calories consumed with the entire family and the percentage of owner occupied units, but a positive correlation with the percentage of calories consumed with some of the family eating together for this same group. This last correlation also existed for the percentage of protein eaten with some of the family. There was a positive correlation, significant at the 1% level, between the percentage of calories consumed with friends and the percentage of dilapidated housing units. Thus subjects from city blocks where there was a higher percentage of renters consumed a smaller percentage of their calories at meals but a larger percentage of their calories while eating with the entire family than did other groups of subjects. On the other hand, those teenagers coming from city blocks where a higher percentage of families owned their homes consumed a lower percentage of their calories with the entire family but a higher percentage of both calories and protein with some of the family eating together. Subjects who resided in city blocks with a larger percentage of dilapidated housing units consumed a greater percentage of their calories with friends.

In terms of where calories were consumed, there was a positive correlation, significant at the 5% level, between the percentage of calories consumed at school by the subjects in the study and the percentage of deteriorating housing units lacking some or all plumbing facilities with no flush toilets. Perhaps subjects from housing units of this type found school a place more conducive to eating than home. On the other hand, there was a negative correlation between the percentage of calories consumed at school and the percentage of renter occupied housing units, indicating that subjects from city blocks with a higher percentage of renters ate a smaller percentage of their total daily caloric intake at school. These results are presented in Table D2 (p. 368).

CHAPTER 6

SPATIAL ANALYSIS OF NUTRITIONAL CHARACTERISTICS

The same kind of spatial analyses have been carried out with respect to the nutritional characteristics considered in this study as were done for food habit characteristics. These include inspection over space of the percentage of the Recommended Dietary Allowances (RDA) consumed, the weight-height ratios of the subjects, and whether or not the subject consumed a vitamin preparation. Analytic techniques used included census tract averages and the histograms and maps derived from these, and simple correlations between nutritional characteristics derived from this study, and U.S. Census Tract and City Block Data. In addition, a section on factor analysis and factor scores is presented which encompasses both food habit and nutritional characteristics. Again, the purpose of this analysis is to show that spatial variation did indeed exist in the nutritional characteristics of the high school students studied in this survey.

Recommended Dietary Allowances

The percentage of the RDA of the various nutrients consumed in a 24 hour period offers some indication as to the quality of nutrient intake of a person or a population. While it should be pointed out that the RDA's are very generous in terms of their adequacy and that 100% of the RDA does not necessarily need to be consumed every day by every person for good nutrition, nonetheless falling very far short of the RDA over a period of time can result in less than optimal nutritional well-being. Diets are often evaluated in terms of the number of nutrients that are consumed in amounts less than 67% of the RDA to indicate the quality of the diet.

The mean percentage consumption for subjects by census tract of all the nutrients considered in this study is given in Table 22. In addition, there are two figures presented in that table which give an overall indication of dietary quality. These figures give the total number of the nutrients studied which were consumed on the average by the subjects in the census tract in amounts less than 100% and less than 67% of the Recommended Dietary Allowances. The following discussion does not include census tracts with only one or two subjects (J-63, J-64, L-17, DT-203, MT-45). However, even when eliminating these tracts, it can be seen that there was wide variation in the quality of the diets consumed.

The mean consumption by subjects in more than half the tracts fell below 100% of the RDA for calories, but none below the arbitrary 67% level. No particular pattern seems to emerge. In the case of protein, all census tract averages were above 100% of the RDA, so clearly the lack of this nutrient is not one to cause concern, at least from a quantitative point of view.

Again, the mean consumption by teenagers in the study in many tracts was well below 100% of the RDA for calcium,

TABLE 22

Percentages of the Recommended Dietary Allowances Consumed
By Census Tracts for a Twenty-Four Hour Period

	Calories	Protein	Calcium	Iron	Vit. A	Thiamin	Riboflavin	Niacin	Ascorbic Acid	Total Number of Nutrients <100% of RDA	Total Number of Nutrients <67% of RDA
Mean Percentage Intake	95	160	93	71	106	102	156	90	161	—	=
Census Tract											
J-01	97	166	90	64	66	96	141	97	159	6	2
J-02	87	118	55	61	32	69	93	82	88	8	3
J-03	78	111	73	55	74	62	128	68	54	7	3
J-04	98	150	92	62	69	94	150	80	149	6	1
J-05	103	190	140	74	126	129	226	83	138	2	0
J-06	114	141	118	52	183	99	216	52	228	2	2
J-07	103	153	111	59	79	95	163	85	79	5	1
J-08	98	166	94	77	81	94	155	98	148	6	0
J-09	88	139	71	65	52	87	126	83	125	6	2
J-10	83	144	86	69	73	94	164	95	109	6	0
J-11	101	168	79	82	108	86	140	105	172	3	0
J-12	95	141	69	70	98	106	121	92	167	5	0
J-13	98	164	79	78	166	102	151	118	142	3	0
J-50	88	159	69	75	88	96	122	103	69	6	0
J-52	101	161	92	71	100	91	149	101	175	3	0
J-53	94	154	87	74	138	102	161	94	189	4	0
J-54	80	117	67	54	48	58	108	56	195	6	4
J-55	94	157	91	70	116	97	151	89	156	5	0

TABLE 22--Continued

	Calo-ries	Pro-tein	Cal-cium	Iron	Vit. A	Thia-min	Ribo-flavin	Niacin	Ascorbic Acid	Total Number of Nutrients <100% of RDA	Total Number of Nutrients <67% of RDA
J-56	116	204	104	95	99	124	182	136	197	2	0
J-57	111	182	109	84	118	128	176	109	187	1	0
J-59	91	122	76	47	52	100	134	87	155	5	2
J-63	38	48	07	27	06	79	30	36	95	9	7
J-64	71	124	59	47	347	52	110	75	285	5	3
J-65	121	212	116	101	84	146	192	124	254	1	0
J-66	84	175	82	79	110	111	146	102	108	3	0
J-67	92	170	84	78	67	108	150	101	111	4	0
J-68	136	179	123	88	163	105	186	100	162	1	0
L-17	75	92	69	54	138	65	104	62	223	6	3
L-34	89	147	88	60	109	100	145	82	139	4	1
L-35	69	117	78	46	76	73	123	62	140	6	2
DT-201	89	177	108	66	120	106	178	93	181	3	1
DT-202	72	122	60	56	77	67	106	80	134	5	2
DT-203	232	403	175	231	244	201	352	223	193	0	0
EL-38	77	141	77	62	177	91	134	76	200	5	1
EL-39	70	127	71	53	71	89	109	68	222	6	1
EL-40	93	196	109	94	179	165	171	98	179	3	0
EL-43	86	161	96	70	139	94	144	92	300	5	0
EL-44	86	157	101	71	98	108	164	75	158	4	0
MT-45	125	243	210	50	73	156	289	70	159	3	1
MT-46	89	164	92	74	96	107	156	96	191	5	0

TABLE 22--Continued

	Calories	Protein	Calcium	Iron	Vit. A	Thiamin	Riboflavin	Niacin	Ascorbic Acid	Total Number of Nutrients <100% of RDA	<67% of RDA
MT-47	87	163	112	64	74	87	178	77	113	5	1
MT-48	88	140	87	67	83	88	142	83	140	6	0
MT-49	101	177	115	78	104	116	185	92	231	2	0
MT-50	134	224	128	94	97	152	211	118	177	2	0
DH-52	81	144	90	60	80	86	152	74	86	7	1
DH-53	92	162	96	71	85	97	165	90	138	6	0
DH-54	97	165	88	73	120	114	151	100	155	3	0
DH-55	91	148	84	83	137	115	153	92	176	4	0
UT	87	140	85	62	88	101	143	76	152	5	1

and also in two tracts (J-02, DT-202), it was below the 67% level. From a spatial standpoint, the subjects in the East Lansing-Okemos area faired better in terms of calcium intake than did those in the rest of the survey area except for a band of tracts across urban Jackson (J-05, J-06, J-07), with the adjacent J-56 and J-57. The results for iron present an even more alarming picture. In only one census tract, J-65, did the average consumption meet the 100% RDA criterion. The average intake for the subjects in many of the tracts was below 67% of the RDA level. These tracts tended to exist together in clusters including one in northern urban Jackson (J-01, J-02, J-03, J-04, J-06 and J-07) plus one in the Waverly School area (L-34, L-35, DT-201 and DT-202). Also, subjects in the entire untracted area, mainly rural Ingham County, consumed only 62% of the RDA. If adolescents do indeed need the amounts of iron recommended by the Food and Nutrition Board of the National Research Council, those involved in this study were undernourished in this respect. There were clearly areas where the teenagers had a very low intake as well as areas where they had a moderate intake.

Vitamin A was consumed on the average in amounts less than 67% of the RDA by the high school students in the study only in urban Jackson (J-01, J-02 and J-09) plus the adjacent tract of J-59. That there was wide variation over space in the percentage of the RDA consumed can be seen from the figures in Table 22. For thiamin, there was again variation over space in the percentage of the RDA consumed, but the areas in which less than 67% of the RDA was consumed appeared to be randomly scattered. The intake of riboflavin appeared to be excellent in all areas. The intake of niacin, for the most part, was fair, with very low mean consumption being limited to subjects in three seemingly randomly placed tracts (J-06, J-54 and L-35).

The percentage intake of the RDA for ascorbic acid showed the greatest spatial variation for any of the nutrients studied. This can clearly be seen from the figures in Table 22, and also from the histogram in Figure 15. Although the intakes in general were quite generous, the subjects in tract J-03 consumed an average of only 54% of the RDA, and those in J-50, only 69%. The reason for this wide variation can no doubt in part be attributed to the wide number of cultural and socio-economic factors to which its consumption was correlated, as is shown in the next section.

In terms of overall quality of diets consumed by the teenagers in the study, those in urban Jackson were clearly the poorest. In census tracts J-01, J-02, J-03, J-06 and J-09, there were either two or three nutrients of the nine considered which were consumed by the subjects on the average in amounts less than 67% of the RDA. In tract J-54, four nutrients were consumed in these low amounts. Two tracts in the Waverly School District (L-35, DT-202) showed mean consumption figures for subjects which were below 67% of the RDA with respect to two nutrients. The quality of the diets eaten in the East Lansing-Okemos area, suburban Jackson and also rural Ingham County was on the whole much better.

Histogram of Daily Mean Percentage Intake of the RDA of
Ascorbic Acid by High School Students by Census Tract

```
SET    1          VARIABLE   21

          N =   49
       MEAN =     161.099
  STD. DEV. =      50.897   (        51.424)
   VARIANCE =    2590.458   (      2644.425)
COEF. OF VAR. =    31.593   (        31.921)
   SKEWNESS =        .385   (          .398)
   KURTOSIS =        .439   (          .421)

 LOWER QUARTILE =     137.135
         MEDIAN =     157.705
 UPPER QUARTILE =     189.728

  RANGE =      54.293 TO      300.480
```

```
                                              1
                                              1
                                              1
                                          1 1 1 1 1
                                      1   1 1 1 1 1     1
                                  1   1   1 1 1 1 1 1   1
                                  1   1   1 1 1 1 1 1   1
                              1 1 1 1 1 1 1 1 1 1 1 1   1   1     1 1
            --I-------I-------I-------I-------I-------I-------I-------I-------I--
Z-SCORE      -4      -3      -2      -1       0       1       2       3       4
RAW SCORE                59.31   110.20   161.10   212.00   262.89
```

FIGURE 15

Simple correlations were carried out between the nutritional variables derived from the study including the percentage of the RDA consumed and socio-economic variables derived from the 1960 U.S. Census Bureau Data. In each case, the individual subject was assigned the U.S. Census Bureau census tract variable of the tract in which he resided. The results are presented in the Appendix in Table C4, p. 362.

Calories and Protein

There was a positive correlation, significant at the 5% level, between the percentage of the RDA for calories consumed by the subjects and the percentage of women who held managerial positions residing in the census tract. There were no significant correlations between percentage intake of protein and the socio-economic variables selected.

Minerals

For the two minerals analyzed in the study, calcium and iron, several significant correlations were found. For calcium, there was a negative relationship, significant at the 1% level, between percentage of the RDA of calcium consumed, and the percentage of female operatives residing in the census tract. In other words, subjects residing in tracts where there was a higher percentage of female operatives, consumed a lower percentage of the RDA for calcium. This same relationship was shown in the previous chapter with respect to milk product consumption, as might be expected. There was a positive correlation significant at the 5% level between calcium intake and the percentage of immigrants residing in the census tract from Czechoslovakia and the USSR, and a negative correlation with the percentage of Poles. Here the positive or negative effect on the percentage of the RDA of calcium consumed might be expected to be related to the types of foods chosen by these ethnic groups--whether or not foods such as milk which are rich in calcium were included in their diet. There were also positive relationships between the intake of calcium and the median years of schooling of people over 25 years of age residing in the census tract, and also the percentage of men and women employed as managers, and the percentage of women employed as professionals. Negative relationships were shown between calcium intake and the percentage of unemployed women in the census tract as well as the percentage of men employed as operatives. Again, all of these relationships were shown to exist also for milk product consumption, and they could indeed be expected to be related, as in the American diet, most of the calcium usually comes from milk products.

For iron, there were three correlations significant at the 5% level. A negative correlation appeared between the percentage of the RDA of iron consumed by the subjects in the census tract and the percentage of people of foreign stock residing in the tract from Czechoslovakia and Italy. In other words, subjects from tracts where there was a higher percentage of immigrants from these countries consumed a lower percentage of the RDA for iron. Again, this is probably accounted for by the types of food common in the diets of these ethnic groups. There was a positive correlation, however, between iron intake and the percentage of women residing in the tract who were employed as private household workers, indicating that subjects from these tracts consumed a larger percentage of the RDA for iron than did others.

Vitamins

For two of the vitamins examined in this study, vitamin A and thiamin, no significant correlations were found with any of the census tract socio-economic variables examined. In the case of riboflavin, there was a negative correlation, signficant at the 5% level, between the percentage of the RDA of riboflavin consumed and the percentage of immigrants from Poland who resided in the tract. Thus, subjects from tracts with a higher percentage of foreign stock from Poland consumed a lower percentage of the RDA for riboflavin. There was a positive correlation between riboflavin consumption and the percentage of men living in the tract employed as managers, indicating that the teenagers in the study from these tracts ingested a higher percentage of the RDA for riboflavin.

In the case of niacin, there was a negative relationship, significant at the 5% level, between the percentage of the RDA consumed by the subjects in the tract, and the percentage of immigrants in the census tract from Germany. On the other hand, there were positive correlations with the percentage of men residing in the census tract who were employed in service occupations, and the percentage of women who were employed as craftsmen, operatives, and laborers. Thus, subjects from tracts with higher percentages of these people consumed a greater percentage of the RDA of niacin.

Ascorbic acid, or vitamin C, showed the largest number of correlations with the census tract socio-economic variables in terms of the various nutrients studied. The number and kind of relationships that appeared were similar in many respects to the results reported in Chapter 3 for the total survey population.

At the 1% level, there were positive correlations between the percentage of the RDA of ascorbic acid consumed, and the percentage of persons residing in the tract from Austria and the USSR. Subjects from tracts then, with a higher proportion of immigrants from these countries, consumed a higher percentage of the RDA for ascorbic acid. Again, it could be assumed that there was an ethnic influence in terms of the types of foods chosen by these people, and in the case of ascorbic acid, it would mean eating more fruits and vegetables. This is borne out by the correlations shown in Chapter 5 between these same groups and fruit consumption. There were also positive correlations with median family income and median years of schooling so that subjects from tracts with higher income or education levels were consuming a greater percentage of the RDA for vitamin C. In terms of occupational relationships, there were positive correlations between ascorbic acid intake and the percentage of men and women residing in the tract employed in professional occupations, and the percentage of men employed as managers. These could be considered higher income groups. On the other hand, there were negative correlations between intake of the percentage of the RDA of ascorbic acid by the subjects in the tract and the percentage of men and women residing there who were employed as operatives, and men who were employed as craftsmen. In these instances then, the subjects in the tract consumed a lower percentage of ascorbic acid. Certain relationships emerged between housing data for census tracts and ascorbic acid intake. These included positive relationships with the percentage of sound housing units in the tract but a negative relationship with the percentage of deteriorating housing units. Again, all of these variables might well be related to economies, particularly to the purchasing of fruit, with the more affluent groups purchasing more.

There were also several correlations significant at the 5% level. These included positive correlations between the percentage of the RDA of ascorbic acid consumed, and the percentage of residents in the census tract from Hungary, Norway and Sweden. There were also positive correlations between vitamin C intake and the percentage of men residing in the census tract employed as salesmen, and the percentage of women employed as managers. These are the same kinds of relationships that appeared significant at the 1% level.

City Block Variables

Simple correlations were carried out also between the percentage of the RDA consumed for the various nutrients studied by the residents of the city of Jackson, and housing variables available from the 1960 U.S. Census Data for the blocks in which the subjects resided. The results can be seen in the Appendix in Table D3, p. 371.

There was a positive correlation, significant at the 5% level, between the percentage of the RDA consumed for protein, calories, and niacin, and the percentage of sound housing units in the city block. In other words, subjects from city blocks where there was a higher percentage of sound housing had a higher percentage intake of the RDA for these nutrients. There were positive correlations, also significant at the 5% level, between the percentage of the RDA of iron and of niacin consumed and the percentage of housing units occupied by blacks. A positive relationship, significant at the 1% level, appeared between the percentage of the RDA of vitamin A consumed and the percentage of housing units in the block occupied by blacks. Thus, subjects from city blocks where there were a higher percentage of blacks residing chose foods which gave them a higher percentage of the RDA for iron, niacin, and vitamin A.

These were the only significant correlations that appeared between percentages of the RDA's consumed and the housing characteristics when considered block by block. Although a few significant relationships appeared, they explained only a very small percentage of the variation.

Weight-Height Relationships

The system used to classify each subject as to body shape (underweight [1], slender [2], normal [3], stocky [4], overweight [5], and obese [6]) was described in Chapters 2 and 4. The figure obtained for each subject was then used to obtain an average figure for each census tract. Of course, these figures tend to hover between [2] and [3], the slender and the normal groups which were the largest. However, even here, there was considerable variation over space. The average figures, by census tract, are presented in Table 23. These classes were also mapped and are shown in Figure 3, (p. 53). It can be seen that there are two distinct core areas where the average weight-height classification of the subjects rose above 3.10. These were in the southwestern section of urban Jackson, and a portion of the Waverly School district. Since obesity continues to be the number one health problem in the United States, it seems important to identify those areas where overweight is a potential problem. These core areas certainly contained some subjects in the upper classes ([4], [5], and/or [6]) to bring the tract average to the level of 3.10 or over.

Simple correlations were done between the weight-height ratio of the subjects and selected socio-economic variables based on the U.S. Census Data for the tracts in which they resided. The results are presented in Table C4 (p. 362). It can be seen that there were several significant relationships found. It should be remembered in the following

TABLE 23

Weight-Height Classification Averages
by Census Tract

Census Tract	Average W/H Classification	Census Tract	Average W/H Classification
J-01	2.73	J-66	3.00
J-02	2.85	J-67	3.17
J-03	2.60	J-68	2.00
J-04	2.71	L-17	3.50
J-05	2.80	L-34	2.52
J-06	2.25	L-35	3.47
J-07	3.00	DT-201	2.72
J-08	2.76	DT-202	3.11
J-09	2.52	DT-203	3.00
J-10	3.30	EL-38	2.22
J-11	3.38	EL-39	2.50
J-12	3.23	EL-40	3.25
J-13	3.18	EL-43	2.55
J-50	2.77	EL-44	2.75
J-52	2.83	MT-45	6.00
J-53	2.80	MT-46	2.75
J-54	3.00	MT-47	3.44
J-55	2.94	MT-48	2.67
J-56	3.00	MT-49	2.59
J-57	2.45	MT-50	2.57
J-59	2.67	DH-52	2.25
J-63	2.00	DH-53	2.85
J-64	2.00	DH-54	3.00
J-65	2.00	DH-55	2.74
		UT	2.89

discussion that the higher the number of the classification, the heavier the student was in relation to his height. In other words, the higher the number, the closer the subject was to being classified as obese. Therefore positive correlations would indicate a relationship with overweight, while negative correlations would indicate a relationship with underweight.

There were negative correlations, significant at the 1% level, between weight-height classification and the percentage of immigrants residing in the tract from Hungary and the USSR. Thus, subjects from these tracts tended more towards underweight. Also negatively correlated were mean years of schooling of people residing in the tract over 25 years of age and median family income. This would indicate that the teenagers in the study who resided in tracts where there was higher family income and level of education tended to be more underweight also. There was a positive correlation between the weight-height classification and the percentage of unemployed men residing in the tract. Subjects from these tracts then tended more towards obesity.

There were several correlations, significant at the 1% level, between weight-height classification and the occupational classification of both men and women residing in the tracts. There were negative correlations, indicating a tendency towards underweight for the subject residing in the tract, with the percentage of both men and women employed as professionals, and with men employed as managers or salesmen.

There were positive correlations, indicating a tendency towards overweight for the subjects residing in the tract, with the percentage of men employed as craftsmen and both men and women employed as operatives. There was also a positive correlation between the percentage of dilapidated housing units in the tract and the weight-height classification, again indicating a tendency towards overweight for the subjects residing in tracts where the percentage of dilapidated houses was higher.

Several correlations were significant at the 5% level. These included a negative correlation with the percentage of residents in the tract who originally came from Norway and Sweden, but a positive relationship with the percentage of unemployed women. There was a positive correlation between the weight-height classification and the percentage of both men and women residing in the tract who were employed as service workers, but a negative correlation with the percentage of women employed in clerical positions. There was also a negative relationship with the percentage of sound housing units in the tract, but a positive relationship with the percentage of housing units having 1.01 or more persons per room. Thus, teenagers in the study who resided in tracts where there was a higher percentage of unemployed women, and of people employed as service workers tended more towards overweight, as did those from tracts where population density per room was greater. On the other hand, subjects from tracts where there was a higher percentage of foreign stock from

Norway and Sweden tended more towards underweight, as did subjects from tracts where there was a higher percentage of women employed in clerical positions. The same tendency towards underweight was true for subjects from tracts where there was a higher percentage of sound housing.

Several reasons might be advanced for the appearance of these relationships. It should be remembered that the correlations applied not to socio-economic variables for the subject himself or his immediate family, but rather for the percentage of this variable that existed in the entire tract. Nonetheless, it is assumed that proximity to these people, and the prevalence of the particular variable being studied had an influence in general on the area studied. The storage of extra calories for the subjects who tended towards underweight was less than for those who tended towards overweight. This could have been because they ate fewer calories or they burned up more calories, or both. The tendency towards underweight seemed to be related to some ethnic groups: Hungary, USSR, Norway and Sweden. Perhaps these groups stress the overall value of lack of overweight, or perhaps they choose foods for their meals that tend to have lower caloric values than other groups. The same reasons could be suggested for groups who had higher family income, more years of schooling, and a higher percentage of sound housing. This would also be related to the occupational categories of professionals, managers and salesmen. On the other hand, other subjects who came from tracts containing a higher percentage of residents with different socio-economic characteristics tended more towards overweight. Again, a variety of reasons might account for this including the idea that to be "big" is a good thing, or the choice of foods in the diet which were higher in caloric value, or simply the consumption of more food. It should be pointed out that foods which are least expensive, such as grain products, and sugars, are often high in calories per serving, and so economics may play a part as well. This is supported by the fact that the subjects who tended towards overweight came from tracts where there were higher percentages of people or things which indicated perhaps less favorable economic status: unemployment, persons employed as craftsmen, operatives, or service workers, dilapidated housing, and high population density per housing unit.

The Use of Vitamin Preparations

The percentage of subjects who took vitamin preparations on a regular basis is presented by census tract in Table 24. These percentages are also mapped in Figure 6 (p. 154). It can easily be seen that there is wide variation from tract to tract in terms of the use of such preparations. If the consumption of vitamin pills on a regular basis can be said to indicate a family's concern for the nutritional well-being of their teenager, then such concern is manifested to a large degree in some areas. On the other hand, non-consumption can hardly be said to indicate indifference, although it may. It could also indicate the feeling of the family that such products are unnecessary (as they usually are) when a variety of foods with high nutritional value are available to the high school student. Only three tracts (J-05, DT-203, and J-54) had more than 50% of the subjects residing in them taking vitamin preparations on a regular basis. However several tracts fell into the range where 30-49% of the subjects in them consumed such preparations regularly. These include J-08, J-10, J-52, J-53, L-34, DT-202, MT-46, MT-48, MT-50 and DH-55. In one of these tracts, DT-202, the average quality of the diet of the subjects residing in the tract was considered low when analyzed in terms of the percentage consumption of the RDA's (see page 215). But in most cases, the tracts where a high percentage of the students consumed vitamin preparations on a daily basis were tracts where the average quality of the diet of these students could also be considered good, if not excellent, on the average (J-08, J-10, J-52, J-53, MT-46, MT-48, MT-50 and DH-55).

TABLE 24

Percentages of High School Students Using Vitamin Preparations by Census Tract

Census Tract	%	Census Tract	%
J-01	07	J-65	20
J-02	15	J-66	14
J-03	00	J_67	14
J-04	12	J-68	00
J-05	60	L-17	00
J-06	00	L-34	33
J-07	00	L-35	26
J-08	31	DT-201	22
J-09	17	DT-202	44
J-10	30	DT-203	100
J-11	17	EL-38	22
J-12	00	EL-39	17
J-13	21	EL-40	25
J-50	23	EL-43	27
J-52	32	EL-44	25
J-53	33	MT-45	00
J-54	66	MT-46	42
J-55	17	MT-47	11
J-56	05	MT-48	40
J-57	18	MT-49	29
J-59	00	MT-50	36
J-63	00	DH-52	25
J-64	00	DH-53	15
		DH-54	21
		DH-55	35
		UT	28

Factor Analysis

Chapter 4 included a discussion of the factor analysis program which was run on certain selected variables, both nutritional and socio-economic, determined in this study for the total survey population. One aspect of this factor analysis has spatial applications, and that is the factor score matrix. This was examined spatially in this study by census tracts. In Chapter 4, the factor matrix was presented with its loadings which indicated the involvement of each variable in producing the pattern of each factor extracted. The factor score matrix gives a score for each census tract on these patterns. R. J. Rummel explains as follows how factor scores are derived.

> Each variable is weighted proportionally to its involvement in a pattern; the more involved a variable, the higher the weight. Variables not at all related to a given pattern. . .would be weighted near zero. To determine the score for a case on a pattern, then, the cases' data on each variable is multiplied by the pattern weight for that variable. The sum of these weight-times-data products for all variables yields the factor score.[1]

Thus census tracts would have high or low factor scores as their values are high or low on variables entering a pattern. Table 25 gives the factor scores for each of the seven factors considered in Chapter 4 by census tract.

Factor 1, the Nutrient Intake Factor, shows two census tracts, J-64 and EL-38, with factor scores over +1.0 or

---

[1]R. J. Rummel, Understanding Factor Analysis. Journal of Conflict Resolution 11:444, 1967.

TABLE 25

Factor Scores by Census Tract

Census Tract	Orthogonally Rotated Factors 1	2	3	6	7	8	9
J-01	-.1048	-.1230	.1447	-.0568	-.2041	.0798	-.0715
J-02	.0917	.1375	.0609	.0848	.2868	.0215	-.1449
J-03	-.2423	.2946	-.4420	-.4017	.5058	.1198	.1186
J-04	-.3473	.2849	-.8040	.3704	.7414	-.4018	-.1548
J-05	.0794	-.4575	-.3533	.2487	.2335	.0795	-.0099
J-06	.4225	-.2367	.3470	.4297	.2532	.4018	.6314
J-07	.3880	.0409	-.2388	.0216	-.3560	.3304	-.3043
J-08	.0137	.2484	-.2576	-.1145	-.1420	-.0292	.2565
J-09	.0278	.1101	-.0194	.0608	.3492	.2388	.0458
J-10	-.1417	-.3308	-.2089	.2233	.2745	.1111	.1344
J-11	-.0374	-.5149	.2434	.4174	-.2980	.3146	-.5729
J-12	.3447	.1820	-.3509	-.0791	-.2539	-.0836	-.2944
J-13	-.1838	.4726	-.2383	.0693	-.0001	-.3564	-.0850
J-50	.0963	.4048	-.0725	-.0627	-.1998	-.3723	-.0516
J-52	-.1840	-.0021	.1139	.0099	-.2629	-.4074	-.3273
J-53	.0340	.0590	.0273	-.0247	.1691	.4488	-.0784
J-54	.0496	-.2328	-.0187	-.1054	.0739	.7810	-.1104
J-55	-.4789	-.7980	.3477	.5450	-.1807	.0943	.3070
J-56	.0488	-.0456	-.6020	.0947	-.0529	-.2499	-.4695
J-57	.5944	.4832	.0098	-.0839	.0269	.5376	.1574
J-59	.2894	.0496	-.0923	.1645	.0663	.3783	.0331
J-63	-.1706	-.0799	-.5016	.1314	-.0325	.8524	-.5493
J-64	-1.1741	-1.4417	-.3810	-.6078	-1.1367	-.1572	-.8443
J-66	.7420	.7147	-.1852	-.5530	.0659	-.0056	-.5928
J-67	-.0481	.3726	.1888	-.4590	.3451	-.0868	-.4784
J-68	.0407	-.2206	.0266	.2312	-.0574	.1247	-.1899
L-17	.5484	-.6654	-.2788	-.4607	-.3839	-.2934	-.1804
L-34	-.2424	.8550	-.3382	-.4174	-.7501	-1.0523	-.6758
L-35	-.1497	.2198	-.2346	.0542	-.0238	-.1945	.3251
DT-201	-.4718	.3144	.1506	.1127	.3208	-.1848	.0362
DT-202	.0823	.3884	.2233	.0355	-.0212	-.3122	.4804
DT-203	-.6487	.4102	-.2248	-.2612	-.1450	.2924	.0583
EL-38	3.4627	.5678	.0290	1.2865	-.3268	.1734	.5154
EL-39	-.2814	-.6618	.0752	.2759	-.2122	-.2395	-.0905
EL-40	-.6112	-.1106	-.1781	-.1895	.0315	-.5394	-.5349
EL-43	.3651	-1.2435	1.0137	.2517	-.0248	-.1409	.6954
EL-44	-.2320	-.3866	.0161	-.1992	-.3070	.2031	.1972
MT-45	.0569	-.5464	.1748	.7773	.5004	-.5063	-.8829
MT-46	.6529	-.7380	-.0678	-1.0508	-.3724	-1.6294	.8319
MT-47	-.0198	-.2806	.3053	.1533	-.2312	-.0901	-.7327
MT-48	.0876	.3892	.3697	-.2453	-.1775	.2153	-.1159
MT-49	-.1504	-.0291	-.0858	-.2193	-.1563	.0845	.1654
MT-50	.1803	-.0793	-.0328	.0612	.2144	.3789	.2284
DH-52	.4561	-.1073	.0192	-.2564	.0720	.3854	.3469
DH-53	-.1247	-.3316	-.0541	-.6013	.6033	.4715	-.5228
DH-54	-.0292	.0553	.2039	.0692	.0501	.0727	.0833
DH-55	.0718	.1486	.0196	.0615	.0230	-.2786	.1284
UT	-.0139	-.0054	-.0112	-.0376	.2277	-.2097	-.2512

under -1.0. As these scores are standardized, that is, scaled so that they have a mean of zero and about two-thirds of the values lie between +1.0 and -1.0, these scores are unusually high and low, and warrant closer examination. Census tract J-64 contained only one subject, however. Census tract EL-38 had a factor score of 3.4627, showing a very high contribution to this factor which showed high loadings on all nutrient intake variables, but a negative loading on sex, in this case indicating the female sex.

Factor 2, the Meal Environment Factor, indicated a type of food habit pattern where the subject ate most of his calories and protein with friends and most of this at school. Two census tracts, J-64 and EL-43 made negative contributions of under -1.0 to this factor, thus indicating the relative absence of this type of pattern in these two areas. A census tract which made a high contribution to this factor, though its factor score was not as high as +1.0, is L-34.

The relationship between meals and snacks in Factor 3, as was pointed out earlier, is a rather obvious one. Here the factor itself has high positive loadings on the percentage of calories and protein obtained from meals and negative loadings on the percentage of calories and protein from snacks. The highest factor score here again comes from census tract EL-43, indicating the strength of this type of food pattern for the subjects in that tract. On the other hand, J-04 had a strong negative factor score for this factor, indicating the relative absence of this intake pattern.

Factor 6, the Meal Away From Home Factor, showed high loadings for both the percentage of calories and of protein eaten away from home. A census tract contributing a high factor score here is EL-38, while MT-46 shows a strong negative contribution.

Factor 7 was labeled the Family Meal Factor as the loadings were high and positive on the variables which indicated the percentage of total calories and protein consumed with some of the family eating together. Census tract J-04 made the highest positive contribution to this factor, while J-64 and L-34 made strong negative contributions. Factor 9 also was related to meal patterns, and was labeled the Solitary Meal Factor. This food pattern showed up strongly among the subjects in tract MT-46, but there were strong negative scores for tracts MT-45, MT-47, and J-64.

A final factor, Factor 8, was related to a different aspect of food habits, Food Purchasing and Preparation. This factor indicated that mother was still the major purchaser and preparer of food in the families of the subjects' studied. Judging by the factor scores, this pattern was especially prevalent in tracts J-54, and J-63, while there was a negative factor score, indicating a relative absence of this pattern in tracts L-34 and MT-46.

Again, these factor scores indicate very clearly that spatial variation does exist in the food habit characteristics of the high school students studied. In a tract such as L-34, for example, a high factor score on the Meal Environment Factor indicated a prevalence of the food consumption pattern in which the subject ate most of his food with friends. This is reinforced by the negative factor scores for Factors 7, Family Meal Factor, and 9, Solitary Meal Factor. On the other hand, tract J-04 had a relatively high positive factor score for the Family Meal Factor (7), but a high negative factor score for the Meal-Snack Factor (3), and a low negative score for the Solitary Meal Factor (9).

CHAPTER 7

SUMMARY AND CONCLUSIONS

The nutritional status of the teenage population in the United States today has been shown to be less than optimal. Evidence of undernutrition, obesity, and complications associated with early pregnancies have been presented. A variety of causes for this sub-optimal nutrition have been put forth and include missed and irregular meal practices, social and emotional maladjustment, peer identification, ethnic and socio-economic factors and consciousness of appearance. The total picture of adolescent food habits and consumption, however, is far from complete, and this study was undertaken in an attempt to provide more insight into the problem with the application of geographical techniques. The area chosen for study was one believed to be typical of mid-western United States, and included portions of Ingham and Jackson Counties in Michigan. The area included urban, suburban and rural sections, and a population which included a variety of socio-economic backgrounds in terms of color, occupation, origin, religion, and so on.

To test the idea that geographical techniques could add considerably to the study of the nutritional status of teenagers, the following hypothesis was advanced: Significant spatial variation exists in the food habits of public high school students in Ingham and Jackson Counties, Michigan.

The sample population employed for this study included approximately 10% of the total 10th, 11th, and 12th grade populations of 14 public high schools in Ingham and Jackson Counties, Michigan. The final sample size was 911 subjects. The students were asked to reply to a series of questions stated on a five page questionnaire, and by this method, information was collected on actual food intake, attitudes towards a variety of foods, other food habit characteristics, and certain socio-economic data. These variables were then transformed into numerical figures which could be used for computer analysis. In addition, each subject was identified by the census tract, and where appropriate, the city block in which he lived. In this way, variables were analyzed by census tract and by city block to obtain a spatial picture. A variety of statistical and other techniques were used for analysis. These included census tract averages, histograms, simple correlations, factor analysis, and mapping.

Food Habits of the Total Survey Population

Nutrient consumption of all teenage subjects in the study showed the following mean daily intakes of nutrients: carbohydrate, 292 grams, fat, 116 grams, protein, 91 grams, kilocalories, 2538, calcium, 1234 mg., iron, 12.7 mg., vitamin A, 4962 I.U., thiamin, 1.4 mg., riboflavin, 2.3 mg., niacin, 16.3 mg., and ascorbic acid, 85 mg. However, there was a considerable range for the total survey population, particularly in the intake of vitamin A and ascorbic acid.

Types of food eaten by the teenagers were examined in terms of the number of servings consumed in a 24 hour period. The "average" teenager in the study consumed 3.7 servings of milk and milk products, 2.6 servings of protein-rich foods, 2.3 servings of vegetables, 1.0 servingsof fruit, 6.8 servings of grain products, 2.0 servings of fats and oils and 2.4 servings of sugars and sweets. Again, however, there was considerable variation between the lowest and highest quartile of subjects in terms of the number of servings of the various types of foods consumed.

Food consumption patterns were examined to determine percentages of the total daily intake of protein and calories consumed in different circumstances. Again using the average figure for the total survey population, 80% of the entire day's calories and 88% of the protein came from meals. Twenty percent of the intake of calories, then, was derived from snacks, but only 12% of the daily protein intake was derived from this source. The average subject consumed 23.3% of his calories alone, 27.6% when the entire family ate together, 16.5% when he was eating with only some of the family, and 32.5% when eating with friends. Comparable figures for protein consumption were 20.5%, 32.1%, 17.4% and 29.9%. Thus he ate more calories alone and with friends, and more protein with the family. The percentage of calories consumed at home was 65.5%, while 24.5% were consumed at school and 9.8% elsewhere. For protein, 68.3% was consumed at home, 23.4% at school and 8.1% elsewhere. A slightly greater percentage of protein was consumed at home, then, and slightly more calories at school and elsewhere.

The mother in the subject's families was still both the major food purchaser and preparer. She was listed by 76% of the subjects as major food purchaser and food preparer. Other categories for major food purchaser which received some affirmative replies were mother and father, father alone, and mother and subject. For major food preparer, other categories included mother and subject, subject alone, mother, subject and other family members, and other. Thus, the father in some families had assumed, at least in part, the food purchasing role, but not that of food preparation to any great extent.

When subjects were asked to indicate attitudes towards a group of 20 foods, certain of these foods were overwhelmingly liked by the great majority. These included french fried potatoes, pizza, spaghetti, chocolate cake, pork chops, milk and cola beverages. Other foods, while liked by some, were disliked by a considerable number as well. Such foods were chop suey, baked custard and oatmeal. Foods unfamiliar to more than 10% of the subjects surveyed included lasagne, fried calves' liver, fried scallops, cauliflower, and baked custard.

Simple correlations were carried out between the food habit characteristics and the socio-economic characteristics derived from this study. Certain generalizations can be made from inspection of this information.

For the intake of all the major food groups except fruit, there was a negative relationship with the subjects' being female, thus indicating, as might be expected, that the girls consumed less food of almost every kind than did the boys. Being female, however, was positively correlated with helping with both food purchasing and preparation, thus indicating an importance of the female adolescent in assuming these roles in the family.

The color of the subject--white or black--was significantly related to a variety of food habit characteristics. The black subject ate more of his calories and protein with friends, and derived more of his total day's calories and protein from snacks than did the white subjects. Black subjects consumed more vegetables, sugars, and protein foods than did whites, but ate less milk and less fats and oils. The blacks cared less for foods such as pizza and spaghetti, and were less familiar with lasagne, chop suey, cauliflower and oatmeal.

The student who worked outside of school showed several food habit characteristics which were correlated with the hours he worked per week (see Figure 14, p. 195). There were positive relationships between the number of hours he worked per week and the percentages of calories and protein eaten elsewhere (than at home or at school) and with friends. The more hours he worked outside of school, the more servings he consumed from the following food groups: vegetables, fats and oils, sugars, meat, fish and poultry, and soft drinks.

The father's level of education showed relationships with a number of food habit characteristics. The higher the level of education of the father, the more milk, protein-rich foods, dark green vegetables, and fruits the subject consumed, while consuming fewer soft drinks. Also correlated with the father's higher level of education was the subjects' liking of such foods as lasagne, and not being unfamiliar with lasagne, chop suey, and cauliflower.

The hours of work that the subject's mother was employed outside the home, as expected, was positively correlated with the other members of the family being involved in both food preparation and food purchasing. The more hours the mother was employed, the less fruit there was consumed by the subject (see Figure 14, p. 195). The number of brothers and sisters the subject had living at home was positively correlated with the number of servings of sugars and sweets that he consumed, and also with a number of family members in addition to or instead of mother being involved in food preparation.

The occupation of the father was related to a variety of food habit characteristics. If the father was employed as a professional person, there was a positive relationship in terms of the subject's consumption of fruits, milk, veal and lamb, and candy, but a negative relationship with the consumption of soft drinks. There was also a negative relationship with indicating the "unfamiliar" category when registering attitudes towards a variety of foods--in other words, these subjects were more familiar with the foods listed than other sub-groups of the survey population. If the father was employed as a manager, the same positive relationship with fruit consumption occurred.

Those subjects whose fathers were employed as salesmen consumed a larger percentage of their calories and protein elsewhere (than at home or school), and also had a higher intake of soft drinks and milk drinks. For subjects whose fathers were employed as operatives and craftsmen, there was a negative relationship with the number of servings of fruit consumed, but a positive relationship with their unfamiliarity with lasagne. Also apparent for those whose fathers were operatives was a higher consumption of soft drinks and potatoes, but a lower intake of milk. Fewer servings of fruit and grain products were consumed by those subjects whose fathers were employed as service workers.

The origin of the parents--Michigan, North Central United States or Other--showed some interesting relationships. For example, if the father's origin was "Other," there was a positive correlation with the number of servings of fish consumed by the subject. If the mother's origin was Michigan, the subject consumed less ice cream, protein mixtures, and dark green vegetables. On the other hand, if the subject's mother came from North Central United States, but not Michigan, he consumed more dark green vegetables and also tomatoes. If the subject's mother came from somewhere other than North Central United States, this was positively correlated with the subject's intake of protein mixtures, grain products, and sugars. In general, the origin of the mother showed a stronger influence on the types of foods consumed by the subjects than did the origin of the father.

Several relationships appeared between the religion that the subject listed for his family, and food habit characteristics. It should be pointed out that these food habit characteristics do not exist as a part of the organized religion as such. Hence, they must reflect some other underlying factors. There was a positive relationship between the Protestant religion of a family and the consumption of fruit by a subject. There was a negative relationship between the subject's family being Roman Catholic and the consumption of fish by the subject, but a positive relationship with poultry consumption. There were positive correlations between the subject's family being Jewish and the subject's intake of dark green vegetables, veal and lamb, and cheese. If the subject listed "Other or None" for religion, there were negative correlations with his consumption of poultry and citrus fruits.

Several correlations were significant between the religion of the subject's family and the family member or members who purchased food. There was a positive relationship between Protestantism and the mother as major food purchaser. On the other hand, there was a negative relationship between mother as major food purchaser and Roman Catholicism, but a positive relationship with mother and father together. A positive relationship existed between Judaism and the father as major food purchaser.

Nutritional Characteristics of the Total Survey Population

Using the RDA as a standard, the nutrient obviously lowest in the subjects' diets was iron. The mean intake here for the total survey population was only 70% of the RDA. For all other nutrients considered, the mean intake was above 90% of the RDA. However, when examining the figures for the lowest quartile of the students, it is immediately apparent that there are several nutrients for which at least one-quarter of the total subjects surveyed received less than two-thirds of the RDA for the 24 hour period involved in the study. These include calories, calcium, iron, vitamin A, thiamin, niacin, and ascorbic acid.

When examining the simple correlations done between the percentage intake of the RDA's and the various socio-economic factors studied, certain generalizations can be made. For all nutrients, there was a negative relationship with the subject's being female, again reinforcing the idea that the teenage girl is poorly nourished. For almost every nutrient, there was a positive relationship with the number of years of education of the father, indicating perhaps that more education for the parents made them more aware of what good nutrition was, and that this was transmitted to the teenager. Another relationship that appeared frequently concerned the subject's not having had pneumonia within the five years previous to the study. Stated another way, there was a positive relationship between intake of the RDA of most nutrients and the subject's having had pneumonia. This might indicate an awareness on the part of the subject and his family of the importance of good nutrition for good health after such an illness had occurred, if not before.

About one-quarter of all the students involved in the study took multi-vitamin preparations on a daily basis. This was affected positively by the level of education of the father and his occupation as a professional man, but negatively by the hours of work per week done by both the subject and his mother, and the father's occupation as an operative.

Weight-height ratios showed most of the students classified as slender to normal. However, there were about 100 who were classified as underweight, and another 100 who were classified as overweight or obese. Overweight was positively correlated with the mother's work hours per week outside the home, the father's occupation as an operative, and the family not adhering to any religious faith. On the other hand, overweight was negatively related to the father's level of education and his occupation as a professional man.

Spatial Analysis of Food Habits

The spatial analysis of food habits and nutritional characteristics presented was carried out using census tracts, and to a certain extent, city blocks as enumeration areas. This type of analysis showed many spatial differences in terms of food consumption patterns.

Total Nutrients Consumed

The subjects in the Okemos School District, a high-income, professionally-oriented area, had high mean intakes of calories, protein, calcium, thiamin, riboflavin, niacin, and ascorbic acid, but a lower intake of vitamin A. Those in the East Lansing area, however, which is similar in income and occupational type, had lower intakes of calories, protein, calcium, iron, riboflavin, and niacin, but higher vitamin A, and also high ascorbic acid intakes.

The Waverly School District, to the west of Lansing, could be described as a "blue-collar" area, where many of the subject's fathers and mothers were employed in the automotive industry located there. The high school students in this area, in general, showed a lower intake of all nutrients than those in the Okemos area, for example. The subjects in urban Jackson also tended to be lower in the intake of all nutrients, with some seemingly randomly scattered exceptions. They were particularly low in their consumption of ascorbic acid. Those in suburban Jackson, on the other hand, tended to be higher in their consumption of all nutrients except vitamin A.

The Holt School District, just south of Lansing, could be considered a middle-class suburban area with people employed mainly in either the state government or the automotive industry. Here, consumption patterns of nutrients by the subjects in the study were again different. Calories, protein, calcium, niacin, and ascorbic acid intakes were low, but iron and thiamin were high.

Types of Food Consumed

Milk consumption by the subjects in the survey was low in the areas with a high percentage of black population in urban Jackson. It was also low in part of the Waverly School District. Areas of high milk consumption by the teenagers were also found in urban Jackson and the Waverly School District, but a more pronounced area was the East Lansing-Okemos area. Correlations between milk consumption by the subjects and 1960 U.S. Census Tract Data showed positive relationships with the level of education, and median family income, and also the percentage of certain foreign-born groups living in the tracts. There was also a positive correlation with the percentage of men residing in the tract employed as professionals, managers and salesmen, but a negative relationship with those employed as operatives or laborers.

Areas of both low and high consumption of protein foods by the students surveyed occurred in urban Jackson and in the East Lansing-Meridian Township area. Also low in protein food intake were teenagers in some of the tracts in the Waverly School District. Intake of foods in this group was positively correlated with the percentage of black residents residing in the tract, and also with the percentage of laborers.

Subjects in two of the census tracts in urban Jackson where the consumption of both milk and protein foods was low, were highest in the number of servings of vegetables they consumed as were the subjects in several other urban Jackson tracts. Other areas of high vegetable consumption by teen-agers included two tracts in East Lansing and one in the Holt School District. Very low vegetable consumption by the subjects was found in just one urban Jackson tract, but was the case in several tracts in the Waverly School District and in parts of Meridian Township. Correlations showed positive relationships between vegetable consumption and the percentage of blacks residing in the tract, the number of unemployed men and women in the tract, the percentage of deteriorating housing in the tract, and the percentage of men employed as private household workers and as laborers.

Fruit consumption by the subjects, though low in general, generated a very definite spatial picture. It was low in urban Jackson, and high in East Lansing and Meridian Township. Positive relationships appeared between fruit consumption and level of education and income of the residents of the tract as well as the percentage of men there employed as managers and salesmen, and men and women employed as professionals. There were negative relationships with the percentage of men residing in the tract who were employed as craftsmen and men and women who were employed as operatives.

Areas of highest grain products consumption by the students surveyed included one tract in Meridian Township plus a few in suburban Jackson. Areas of lowest intake by the subjects were in western suburban Jackson, the city of

East Lansing, Meridian Township and the Waverly School District. The students in urban Jackson showed a very consistent median intake of grain products. The number of servings of fats and oils consumed by the teenagers, in general, did not vary greatly from tract to tract. Those in suburban Jackson did show a slightly higher intake than those in other areas.

The consumption of sugars and sweets by the high school students surveyed showed considerable variation from tract to tract, and presented a very definite spatial pattern. The subjects in the entire urban area of Jackson plus much of the suburban area consumed higher amounts of foods in this group than did those in the East Lansing and Meridian Township areas. Positive relationships were shown between consumption of sugars and sweets and the percentage of blacks, of unemployed males and females, of men employed as laborers and service workers, and of foreign stock residing in the tract. On the other hand, there was less sugar consumption by subjects who resided in tracts where there was a higher level of education, a higher median number of rooms per housing unit, or a higher percentage of sound housing units.

Meal Patterns

The percentage of the total day's calories and protein consumed at meals by the subjects was below the census tract mean in most of urban Jackson, and also in much of Meridian Township and the Waverly School District. In these areas, then, snacks were contributing more to protein and calorie intakes of the subjects than in other areas. Subjects in rural Jackson and Ingham counties consumed more of their calories and protein at meals.

The subjects' mean consumption of the total day's calories by census tract was 66% at home, 23% at school and 10% elsewhere. Subjects in the Waverly School District, and urban and northern suburban Jackson consumed fewer calories at home. On the other hand, the East Lansing and Okemos subjects tended to consume more calories at home and less at school and elsewhere. Percentages for protein consumption were very similar.

Correlations showed positive relationships between calories consumed at home by the students in a tract and the percentage of men and women employed as professional people residing in the tract. There were negative relationships, however, with the percentage of men and women employed as craftsmen and operatives in the tract.

In some parts of the total survey area, the average consumption of the day's total protein eaten alone by subjects was 25% or more. This included large parts of East Lansing and Meridian Township, part of the Waverly School District, and parts of urban Jackson. Those in suburban Jackson, on the other hand, ate considerably less protein alone. Eating together as an entire family occurred, on a percentage basis, most often to subjects in rural Ingham county, East Lansing, Okemos, and most of suburban Jackson. Some of the family eating together was an important pattern for teenagers in most of urban Jackson, and some of suburban Jackson and the Holt School District. The amount of the total day's protein and calories which the subjects ate with friends was highest in several tracts of urban Jackson, the Waverly School District, and areas of suburban Jackson. Correlations showed positive relationships between the percentage of calories consumed by the subjects with friends and the percentage of unemployed males and operatives residing in the tract, and also with the percentage of housing units owned by blacks and the percentage of deteriorating housing units in the tract.

Purchasing and Preparing Food

The mother was still the major food purchaser and preparer in the majority of areas covered by this study. In Meridian Township and some areas of suburban Jackson, the mother was almost entirely responsible for food purchasing. However, in areas of East Lansing and urban Jackson, under 70% of the mothers were listed as food purchasers. In many of these areas, mother and father, or father alone was listed as the major food purchaser by the subject.

In terms of major food preparation, the same general areas are included where mother was listed by less than 70% of the subjects as being the major preparer. However, a wide variety of responses was listed for the person or persons responsible for food preparation in these cases.

Attitudes Towards a Selected Food

A single food, lasagne, was analyzed spatially with respect to the attitude of the subjects towards it. A wide variety of responses was given about it, including unfamiliarity. The census tracts where 40% or more of the subjects indicated that they liked lasagne very much are almost all in the East Lansing-Okemos area. On the other hand, those census tracts where 40% or more of the subjects responded that they were unfamiliar with lasagne include much of urban and suburban Jackson as well as rural Ingham County.

City Block Data

Correlations yielded a few significant relationships between food habit characteristics of the subjects in the study residing in urban Jackson and the housing variables obtained from the 1960 U.S. Census Data for city blocks in which they lived. There was a positive relationship between the percentage of housing units occupied by blacks and the number of servings of protein-rich foods consumed. Intake of vegetables and sugars was positively related to the percentage of sound housing units lacking plumbing in the city block. Correlations indicated a higher consumption of fatty foods by those subjects in blocks where the economic conditions are generally considered to be more favorable with respect to housing: the residents living in sound units, being owners, and being white.

There was a positive relationship shown between the percentage of the total day's calories consumed by the subjects with friends and the percentage of dilapidated housing units in the city block. There was also a positive relationship between the percentage of calories consumed at school and the percentage of deteriorating housing units lacking some or all plumbing facilities.

Spatial Analysis of Nutritional Characteristics

Using the Recommended Dietary Allowances as an indicator, the diet of the "average" subject in the various census tracts was judged as to quality. Iron was the nutrient consistently lowest in terms of the RDA, with the mean intake in only one of the census tracts achieving 100% of this allowance. In terms of overall quality of the diet, the subjects in urban Jackson clearly had the poorest food intake. In five tracts, there were either two or three nutrients of the nine considered which were consumed by the average subject in amounts less than 67% of the RDA. Subjects in two tracts in the Waverly School District showed a similar lack. The quality of the diets consumed by subjects in the East Lansing-Meridian Township area, suburban Jackson and rural Ingham county was on the whole much better.

Correlations showed relationships, both positive and negative, between the percentage intake of the RDA of many of the nutrients consumed by the subjects with the ethnic background of persons residing in the census tracts. There was a positive relationship between the percentage of the RDA of calcium consumed by the subjects and the level of education of people residing in the census tract. Ascorbic acid intake showed the largest number of correlations with the census tract socio-economic variables in terms of the various nutrients studied. Included were positive correlations with median family income and years of schooling, and also with the percentage of men employed as professionals, managers, and salesmen residing in the tract. Negative relationships existed between ascorbic acid intake by the subjects and the percentage of people residing in the tract employed as operatives and craftsmen, as well as with the percentage of deteriorating housing units in the tract.

The percentage of overweight students, judged by using a weight-height ratio, was greatest in the southwestern section of urban Jackson, and a portion of the Waverly School District. Positively related to overweight were the 1960 U.S. Census variables of percentage of unemployed persons residing in the tract, the percentage of people employed as craftsmen, operatives, and service people, and the percentage of dilapidated housing units. Negatively correlated with overweight were level of education, median family income, percentage of sound housing, and the percentage of persons employed as professionals, managers, or salesmen in the tract.

Multi-vitamin preparations were consumed regularly by a fairly large number of subjects. Spatially, the areas where these were consumed tended to coincide with the areas where the quality of the diet of the teenagers was considered good. The one exception was in the Waverly School District where regular consumption was practiced by 44% of the subjects, and the average quality of the diet of these subjects was considered poor.

Conclusions

It would seem appropriate to establish conclusions from this study by examining the corollaries originally put forth in the section in Chapter 1 dealing with the basic hypothesis.

1. The problems of adolescent nutrition are not spread equally over space, but rather exist in pockets. In other words, regions of good and poor teenage nutrition can be established.

This study produced clear evidence that there is considerable variation over space of a variety of food habit and nutritional characteristics. In terms of diet quality, for example, the teenage subjects in a large part of the urban area studied ate the poorest diet, while the subjects living in rural areas and also in a relatively affluent suburban area consumed a much higher quality diet, based on a comparison of their nutrient intake with the Recommended Dietary Allowances.

2. Those nutrients that are deficient from the diets of teenagers can be identified, and the spatial distribution of this deficiency can be mapped.

In terms of the total survey population, the nutrient most deficient in the diet of the subjects in this study was iron, based on the percentage of the RDA consumed. The mean figure here was 70%. When viewed spatially, the areas of lowest intake by the subjects were a large urban area, a suburban area containing many "blue-collar" workers, and the rural area surveyed. Other nutrients which tended to be low in terms of their intake by teenagers were calories, calcium, and niacin. Again, all of these showed considerable variation over space in terms of the percentage of the RDA consumed by the subjects in different areas.

On the other hand, certain nutrients appeared to be well supplied to all teenagers surveyed: protein and riboflavin. For other nutrients such as ascorbic acid and vitamin A, while the mean intake for the total survey population was over 100% of the RDA, spatial distribution showed subjects in many areas with intakes below 100%. Ascorbic acid, for example, was quite low in many urban areas. These differences were mapped, and are shown in Figures 4, 5, and 6 (pp. 150, 152, 154).

3. Obesity exists as a teenage problem, and varies in amount over space.

Obesity was judged for the teenagers in this study on the basis of a weight-height ratio. Using this guide, there were 88 subjects who were classified as overweight or obese, and another 71 who were classified as stocky. Although these subjects were spread throughout the survey area, a higher percentage of them existed in certain areas--an urban area and the "blue-collar" suburban area. On the other hand, there were more subjects who were classified as underweight or slender in most of the more affluent suburban areas and some urban areas where family income was low.

4. Spatial variation in teenage nutritional problems can be explained in part by identifiable social, cultural, and economic factors.

Any variation over space could be said to be caused by the sum of all of the factors which are operating and interacting at the various points of the earth's surface at that particular time. Therefore, if all factors influencing teenagers' food habits were known, the variation created over space when analyzing these food habits could be explained. An attempt was made in this study to identify those social, cultural and economic factors which were related to their total food intake behavior. Correlations showed relationships existing between food intake patterns and such things as color and ethnic background, sex, parental occupation and education, family income, subject's employment outside of school, housing, and religion. While no one factor explained a large amount of variation, when considered all together, these factors do offer some explanation as to why there is spatial variation in nutritional problems. Because a variety of these factors interrelate in different areas, variation in food habit and nutritional characteristics could be expected, and this was what was actually shown to occur.

5. The family, the home, and the school play a significant role in the nutritional status of teenagers.

It has already been shown that many family-based factors such as parental education, occupation, income, religion, and ethnic background do influence the nutrients received by these adolescents. The family influence showed up in other ways too. For example, there was a negative relationship between the hours of work the mother was employed outside the home and the amount of fruit consumed by the subjects. Also, when the entire family ate together, as a unit, the subjects consumed an average of 28% of their total daily calories but 32% of their total daily protein, thus indicating a slightly positive effect on the intake of this important nutrient. When the subjects ate alone or with friends they consumed more calories but less protein.

The home, in terms of housing, also appeared to be an important influence on the teenagers' food habits. The presence of sound housing units in the area where the subject lived was positively related to his consumption of fruits and of ascorbic acid. On the other hand, deteriorating housing units were associated negatively with the same factors. Deteriorating and dilapidated housing units were also positively related to the percentage of the day's total calories eaten at school and with friends, indicating a trend away from consuming food at home for subjects living where this type of housing was prevalent.

The school played an important but varied role in terms of the teenagers' food intake. Although all subjects in the study were required to remain in the school over the lunch hour, it was the observation of the researcher that many chose not to eat anything at school at all. However, the mean percentage of the total day's calories consumed at school for the entire survey population was 25%, with the percentage of protein slightly lower, 23%. These nutrients could have been derived from the school's hot lunch program, from the subject's lunch brought from home, or in many instances, vending machines.

Geographical Significance

A major objective of this research was to apply geographical techniques to the study of teenage food habits and nutritional status in an attempt to gain more insight into the problems outlined. As was pointed out in the first chapter, two main areas of geography were involved: consumption geography and medical geography. In terms of consumption geography, Spencer's request for "primary consumption patterns"[1] has been met by the mapping of various food habit characteristics by census tracts, including the number of servings per day of the major food groups as well as the intake of multi-vitamin preparations by the teenagers in the study. These are shown in Figures 8, 10, and 14 (pp. 159, 171, 195).

Medical geography, as a study of the spatial variation of health and disease, encompasses the whole field of nutritional status. In this study the spatial variation examined was more health-related than disease-related as obvious nutritional deficiency diseases are rare in the United States

[1]Spencer, p. 630.

today. However, much evidence was cited to show that the nutritional status of the teenager is often less than optimal and hence could well be related to less than perfect health. McGlashan states: "Health. . .needs to be studied in its spatial variations, in which the concept of 'degrees of health' makes up a continuum from the ideal of absolute physical, mental and social well-being through variations of diseasedness to death."[2] Therefore, data was compiled and maps were prepared which showed the spatial variation in intake by the subjects in the study of several of the nutrients known to be needed by humans. Furthermore, the amounts of these nutrients ingested by the teenagers were analyzed spatially in terms of their percentage intake of the Recommended Dietary Allowances established by the Food and Nutrition Board of the National Research Council. Also encompassed by medical geography is spatial variation in obesity, as obesity is considered by many nutritionists and other medical personnel to be the number one public health problem in the United States today. Therefore, by using a weight-height ratio, varying degrees of obesity were established among the subjects, and these were in turn mapped by census tracts. (Figure 3, p. 53).

Thus, the original hypothesis that significant spatial variation existed in the food intake of public and high

---

[2]N. D. McGlashan (ed.), Medical Geography (London: Methuen & Co. Ltd., 1972), p. 6.

school students in Ingham and Jackson counties, Michigan, has been shown to be true in a variety of ways. It can only be hoped that the understanding of the amount and kind of spatial variation will lead to more success in upgrading teenage nutrition.

APPENDIX

APPENDIX A

Questionnaire

APPENDIX A

Questionnaire

Name	______	Date	______	Time	______
Address	______	Age	______	Sex	______
Census Tract	______	Grade	______	Do you take a vitamin preparation? ______	
Height	______	Weight	______	How often? ______	What brand? ______

1. Twenty-four hour recall. Beginning now, and working backwards to this same time yesterday, please mention all the foods you have eaten and in what quantity. I would also like to know with whom you ate.

Food Item	Amount	Approximate Time Eaten	Part of a Meal (M) or Snack (S)	Eaten Alone (A) With All of Family (F) Some of Family (S) Or With Friends (X)	Where was this eaten? Home (H) School (S) Elsewhere (E)

Food Item	Amount	Approximate Time Eaten	Part of a Meal (M) or Snack (S)	Eaten Alone (A) With All of Family (F) Some of Family (S) Or With Friends (X)	Where was this eaten? Home (H) School (S) Elsewhere (E)

2. If you could have anything that you wanted, please tell me what you would include in an "ideal" meal for:

Morning	Evening
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

Tell me about yourself and your family.

3. Are you a diabetic? _____Yes _____No

4. Have you had any major illnesses in the past five years? What were they?

Illness	Year
__________________________	________
__________________________	________
__________________________	________

5. Do you have a job outside of school? ___Yes ___No If yes, what is it?______________

How many hours do you work per week?_________

6. What is your father's age?____ What is his occupation? ______________________________

What is the highest level of education that he completed? Grade School_______________

High School______ College_______ Graduate degree_______ Which_______

264

7. What is your mother's age?___ Does she work outside the home?____Yes ____No
If yes, what is her occupation?______________How many hours does she work per week?___
What is the highest level of education that she completed? Grade School______________
High School__________ College__________ Graduate degree__________ Which______________

8. How many brothers do you have living at home?_____ What are their ages?_____________
How many sisters do you have living at home?______ What are their ages?_____________

9. Who usually purchases the food for your family?______________________

10. Who generally does the food preparation for your family?______________________

11. Where have you lived in the past five years?

City	State	Country	Number of Years

12. What is the region or country of origin of your

Mother?__________________ Mother's parents? Mother__________________
Father__________________

Father?__________________ Father's parents? Mother__________________
Father__________________

13. To which, if any, of the religious groups listed does your family belong?

1. Protestant (which?)________________
2. Catholic
3. Jewish
4. Mixed (which?)______________________
5. Other (which?)______________________
6. None

Please place a check in the column that most closely describes your attitude towards each of the food items listed.

Food Item	1 Like very much	2 Like slightly	3 Neither like nor dislike	4 Dislike slightly	5 Dislike very much	6 Do not know, as I am unfamiliar with it
French fried potatoes						
Lasagne						
Chili con carne						
Chop suey						
Fried calves' liver						
Sauerkraut						
Pizza						
Fried scallops						
Cooked spinach						
Spaghetti with tomato and meat sauce						
Cooked cauliflower						
Cooked beets						
Chocolate cake						
Baked custard						
Whole milk						
Cola beverages						
Hard-cooked eggs						
Pork Chops						
Oatmeal						

APPENDIX B

Relationships (r values) Between Food Habit
and Nutritional Characteristics, and
Socio-Economic Variables
Derived from the Study

TABLE B1

Relationships (r values) Between Types of Food Consumed and Socio-Economic Variables Derived from the Study[a]

	Age	Grade	Sex[b]	Color[c]
Milk & Milk Products	-.080973		-.377672	-.082844
Milk & Milk Drinks			-.366830	-.071144
Fresh Fluid Milk			-.369447	
Milk Drinks				
Cream, Ice Cream, Milk Desserts			-.143382	
Frozen Desserts	-.073842	-.082319	-.157907	
Cheese			-.083814	
Protein Foods			-.355161	.086196
Meat, Poultry, Fish			-.283131	.099423
Beef			-.173353	
Pork			-.161435	
Veal, Lamb				
Liver				
Game & Luncheon Meat			-.127011	
Poultry	-.083676			.090624
Fish				
Eggs			-.137300	
Legumes				.205000
Nuts	-.172778	-.072896	-.120005	
Protein Mixtures			-.090700	
Vegetables			-.175419	.108633
Potatoes			-.164106	.126615
Dark Green, Deep Yellow				
Tomatoes				
Other Vegetables			-.098455	
Vegetable Mixtures				

[a]All figures presented were highly significant; r = .088, significant at the 1% level of probability; r = .067, significant at the 5% level of probability. N = 911.

[b]Male subjects were coded (1); female subjects were coded (2).

[c]White subjects were coded (1); non-white subjects were coded (2).

TABLE B1--Continued

	# of Illnesses	RH Fever[d]	Pneumonia[d]	Bronchitis[d]	Mono-nucleosis[d]
Milk & Milk Products			-.084233		
Milk & Milk Drinks			-.104581		
Fresh Fluid Milk			-.086014		
Milk Drinks					
Cream, Ice Cream, Milk Desserts					
Frozen Desserts					
Cheese					
Protein Foods					
Meat, Poultry, Fish					
Beef					
Pork					
Veal, Lamb			-.119428		-.139068
Liver					
Game & Luncheon Meat					
Poultry					
Fish					
Eggs					
Legumes					
Nuts					
Protein Mixtures					
Vegetables					
Potatoes					
Dark Green, Deep Yellow					
Tomatoes					
Other Vegetables				-.097974	
Vegetable Mixtures					

[d]Subjects who indicated that they had had these illnesses within the past five years were coded (1); all others were coded (2).

TABLE B1--Continued

	Subject's Work Hrs/Week	Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves in Past 5 Years	# of Siblings
Milk & Milk Products			.131507				
Milk & Milk Drinks			.104315				
Fresh Fluid Milk			.102541				
Milk Drinks							
Cream, Ice Cream, Milk Desserts						.071377	
Frozen Desserts							
Cheese			.110255				
Protein Foods			.092786			.089565	
Meat, Poultry, Fish	.076463		.101830				
Beef	.096140						
Pork							
Veal, Lamb			.105350				
Liver							
Game & Luncheon Meat							
Poultry							
Fish	-.069177						
Eggs							
Legumes							.124546
Nuts						.127178	
Protein Mixtures							
Vegetables	.090254						
Potatoes	.112767						
Dark Green, Deep Yellow			.087353				
Tomatoes							
Other Vegetables			.129866				
Vegetable Mixtures							

TABLE B1--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
Milk & Milk Products	.076634				
Milk & Milk Drinks					
Fresh Fluid Milk					
Milk Drinks					.091862
Cream, Ice Cream, Milk Desserts	.078475				
Frozen Desserts					
Cheese			.120276		
Protein Foods					
Meat, Poultry, Fish			.080521		
Beef					
Pork					
Veal, Lamb	.076699				
Liver					
Game & Luncheon Meat				.074196	
Poultry					
Fish					
Eggs					
Legumes					
Nuts					
Protein Mixtures					
Vegetables					
Potatoes					
Dark Green, Deep Yellow					
Tomatoes			.092175		
Other Vegetables	.093566		.081555		
Vegetable Mixtures					

TABLE B1--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
Milk & Milk Products		-.085685			
Milk & Milk Drinks					
Fresh Fluid Milk	.075992				
Milk Drinks				.071713	
Cream, Ice Cream, Milk Desserts		-.087682			
Frozen Desserts		-.074781			
Cheese					
Protein Foods					
Meat, Poultry, Fish					
Beef				.081965	
Pork					
Veal, Lamb					
Liver					
Game & Luncheon Meat					
Poultry					
Fish					
Eggs		-.070372		.082700	
Legumes					.100912
Nuts					
Protein Mixtures					
Vegetables					
Potatoes		.091735			
Dark Green, Deep Yellow					
Tomatoes					
Other Vegetables					
Vegetable Mixtures					

TABLE B1--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
Milk & Milk Products						
Milk & Milk Drinks						
Fresh Fluid Milk						
Milk Drinks						
Cream, Ice Cream, Milk Desserts				-.095321		
Frozen Desserts				-.078576		
Cheese						
Protein Foods						
Meat, Poultry, Fish			.071416			
Beef						
Pork						
Veal, Lamb						
Liver						
Game & Luncheon Meat						
Poultry			.084124			
Fish						
Eggs						
Legumes						
Nuts						
Protein Mixtures				-.071486		.105114
Vegetables						
Potatoes						
Dark Green, Deep Yellow				-.080159	.089769	
Tomatoes					.075776	
Other Vegetables						
Vegetable Mixtures						

TABLE B1--Continued

	Family Religion				
	Protestant	Catholic	Jewish	Mixed	Other or None
Milk & Milk Products					
Milk & Milk Drinks					
Fresh Fluid Milk					
Milk Drinks					
Cream, Ice Cream, Milk Desserts					
Frozen Desserts					
Cheese			.071318		
Protein Foods					
Meat, Poultry, Fish					
Beef					
Pork					
Veal, Lamb			.161530		
Liver					
Game & Luncheon Meat					
Poultry		.077083			-.082395
Fish		-.082782			
Eggs					
Legumes					
Nuts					
Protein Mixtures					
Vegetables					
Potatoes					
Dark Green, Deep Yellow			.132385		
Tomatoes					
Other Vegetables					
Vegetable Mixtures					

TABLE B1--Continued

	Age	Grade	Sex[b]	Color[c]
Fruits		.077517		
Citrus Fruits		.071180	-.082528	
Dried Fruits				
Other Fruits				
Grain Products	-.111989		-.405117	
Whole Grain or Enriched	-.104152		-.408674	
Pastes & Cereals	-.123145		-.210656	
Bread	-.092142		-.406639	
Other Baked Goods				
Non-enriched			-.174449	
Pastes & Cereal				
Bread			-.089671	
Other Baked Goods			-.165722	.070871
Grain Mixtures			-.120474	
Fats and Oils			-.143743	-.084984
Sugars and Sweets			-.193617	.126246
Sugars, Sirups, Candies			-.129462	.087698
Sugar			-.112925	.163736
Sirups & Honey				
Jellies & Jams			-.132585	
Candies				
Soft Drinks and Dessert Powders			-.162848	.101165
Soft Drinks			-.166828	.112113

TABLE B1--Continued

	# of Illnesses	Rheumatic Fever[d]	Pneumonia[d]	Bronchitis[d]	Mononucleosis[d]
Fruits					-.140234
Citrus Fruits				-.075534	-.105650
Dried Fruits					
Other Fruits					-.099253
Grain Products					
Whole Grain or Enriched	-.095839				
Pastes & Cereal	-.077838				
Bread					
Other Baked Goods					
Non-enriched					
Pastes & Cereal					
Bread					
Other Baked Goods					
Grain Mixtures					
Fats and Oils					
Sugars and Sweets					
Sugars, Sirups, Candies					
Sugar					
Sirups & Honey					
Jellies & Jams					
Candies					
Soft Drinks & Dessert Powders					
Soft Drinks					

TABLE B1--Continued

	Subject's Work Hrs/Week	Father's Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves	# of Siblings
Fruits			.175882	.097813	-.104353		-.088563
Citrus Fruits			.105362	.069031			-.093881
Dried Fruits							
Other Fruits	-.070613		.147444	.071915	-.096161		
Grain Products							
Whole Grain or Enriched							
Pastes & Cereals							
Bread							
Other Baked Goods						.069982	
Non-enriched			.094396				
Pastes & Cereals							
Bread			.070479				
Other Baked Goods			.085058				
Grain Mixtures				-.081097			
Fats and Oils	.097716						
Sugars and Sweets	.101993						
Sugars, Sirups, Candies							.071139
Sugar				-.083233			.079444
Sirups & Honey							
Jellies & Jams						.113905	
Candies							
Soft Drinks & Dessert Powders	.147731		-.069810				
Soft Drinks	.161197		-.070543				

TABLE B1--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
Fruits	.124857		.087736		
Citrus Fruits	.096671				
Dried Fruits					
Other Fruits	.086618		.113542		
Grain Products					
Whole Grain or Enriched					
Pastes & Cereals					
Bread					
Other Baked Goods					
Non-enriched					
Pastes & Cereal					
Bread			.071767		
Other Baked Goods					
Grain Mixtures					
Fats and Oils					
Sugars and Sweets					
Sugars, Sirups, Candies					
Sugar					
Sirups & Honey					
Jellies & Jams					
Candies	.088958				
Soft Drinks & Dessert Powders	-.097299				.105163
Soft Drinks	-.104921				.105082

TABLE B1--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
Fruits	-.071708	-.071068	-.071456		
Citrus Fruits					
Dried Fruits					
Other Fruits					
Grain Products			-.089878	.078021	
Whole Grain or Enriched					
Pastes & Cereals					
Bread					
Other Baked Goods					.082769
Non-enriched				.147304	
Pastes & Cereals					
Bread					
Other Baked Goods				.156593	
Grain Mixtures			-.092592		
Fats and Oils					
Sugars and Sweets					
Sugars, Sirups, Candies					
Sugar			-.091653		
Sirups & Honey					
Jellies & Jams					
Candies					
Soft Drinks & Dessert Powders					
Soft Drinks		.075038			

TABLE B1--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
Fruits						
Citrus Fruits						
Dried Fruits						
Other Fruits						
Grain Products						.071893
Whole Grain or Enriched						
Pastes & Cereals						.075138
Bread						
Other Baked Goods						
Non-enriched						
Pastes & Cereal						
Bread						
Other Baked Goods						
Grain Mixtures						
Fats and Oils						
Sugars and Sweets						.071466
Sugars, Sirups, Candies						
Sugar						
Sirups & Honey						
Jellies & Jams						
Candies						
Soft Drinks & Dessert Powders						
Soft Drinks						

TABLE B1--Continued

	Family Religion				
	Protestant	Roman Catholic	Jewish	Mixed	Other or None
Fruits	.106481				
Citrus Fruits	.088365				-.074729
Dried Fruits					
Other Fruits					
Grain Products					
Whole Grain or Enriched					
Pastes & Cereals					
Bread					
Other Baked Goods					
Non-enriched	.074164				
Pastes & Cereals					
Bread					
Other Baked Goods	.072040				
Grain Mixtures					
Fats and Oils					
Sugars and Sweets					
Sugars, Sirups, Candies					
Sugar					
Sirups & Honey					
Jellies & Jams					
Candies					
Soft Drinks & Dessert Powders					
Soft Drinks					

TABLE B2

Relationships (r values) Between Calorie and Protein Intake of Subjects in Different Environments and Socio-Economic Variables Determined in this Study[a]

Calories	Age	Grade	Sex[b]	Color[c]
Meals - % from	.075196	.090639		-.078971
Snacks - % from	-.086593	-.093546		.081877
Eaten Alone				
Eaten with All of Family				
Eaten with Some of Family				
Eaten with Friends				.131501
Eaten at Home	-.085743	-.075790		
Eaten at School				
Eaten Elsewhere	.108098	.079099		
Protein				
Meals - % from				-.075478
Snacks - % from				.079072
Eaten Alone				
Eaten with All of Family				-.070096
Eaten with Some of Family				
Eaten with Friends				.101187
Eaten at Home	-.084558	-.069545		
Eaten at School				
Eaten Elsewhere	.115090	.100681		

[a]All figures presented were highly significant; r = .088, significant at the 1% level of probability; r = .067, significant at the 5% level of probability. N = 911.

[b]Male subjects were coded (1); female subjects were coded (2).

[c]White subjects were coded (1); non-white subjects were coded (2).

TABLE B2--Continued

Calories	# of Illnesses	Rheumatic Fever[d]	Pneumonia[d]	Bronchitis[d]	Mono-nucleosis[d]
Meals - % from					
Snacks - % from					
Eaten Alone					
Eaten with All of Family					
Eaten with Some of Family					
Eaten with Friends		-.071714			
Eaten at Home	-.072696	.092304	.069022		
Eaten at School					
Eaten Elsewhere		-.082546	.074389		
Protein					
Meals - % from					
Snacks - % from					
Eaten Alone					
Eaten with All of Family					
Eaten with Some of Family					
Eaten with Friends		-.078349			
Eaten at Home	-.076864	.096986	.069917		
Eaten at School					
Eaten Elsewhere		-.091747	-.091166		

[d]Subjects who indicated that they had had these illnesses within the past five years were coded (1); all others were coded (2).

TABLE B2--Continued

Calories	Subject's Work Hrs/Week	Father's Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves	# of Siblings
Meals - % from							
Snacks - % from							
Eaten Alone			.074716				
Eaten with All of Family	-.139105						
Eaten with Some of Family							
Eaten with Friends	.161160						
Eaten at Home	-.263387						
Eaten at School							
Eaten Elsewhere	.279586						
Protein							
Meals - % from	-.079123						
Snacks - % from							
Eaten Alone			.077143	.074776			
Eaten with All of Family	-.134033						
Eaten with Some of Family							
Eaten with Friends	.146344						
Eaten at Home	-.231150						
Eaten at School							
Eaten Elsewhere	.257722						

TABLE B2--Continued

	Father's Occupation				
Calories	Professional	Farmer	Manager	Clerical	Sales
Meals - % from					-.071283
Snacks - % from					.074464
Eaten Alone					
Eaten with All of Family					
Eaten with Some of Family					
Eaten with Friends					
Eaten at Home					
Eaten at School					
Eaten Elsewhere					.089894
Protein					
Meals - % from					
Snacks - % from					
Eaten Alone	.083400				
Eaten with All of Family		.074543			
Eaten with Some of Family					
Eaten with Friends					
Eaten at Home					
Eaten at School					
Eaten Elsewhere					.110581

TABLE B2--Continued

Calories	Craftsman	Operative	Service	Farm Laborer	Other Laborer
			Father's Occupation		
Meals - % from				-.073091	
Snacks - % from				.074282	
Eaten Alone					
Eaten with All of Family					
Eaten with Some of Family					
Eaten with Friends					
Eaten at Home					
Eaten at School					
Eaten Elsewhere					
Protein					
Meals - % from					
Snacks - % from					
Eaten Alone					
Eaten with All of Family					
Eaten with Some of Family					
Eaten with Friends					
Eaten at Home			-.075895		
Eaten at School					
Eaten Elsewhere					

TABLE B2--Continued

	Father's Origin			Mother's Origin		
Calories	Michigan	North Central	Other	Michigan	North Central	Other
Meals - % from						
Snacks - % from						
Eaten Alone						
Eaten with All of Family						
Eaten with Some of Family				-.076459		.082287
Eaten with Friends						
Eaten at Home						
Eaten at School						
Eaten Elsewhere						
Protein						
Meals - % from						
Snacks - % from						
Eaten Alone						
Eaten with All of Family						
Eaten with Some of Family						
Eaten with Friends						
Eaten at Home						
Eaten at School						
Eaten Elsewhere						

TABLE B2--Continued

	Family Religion				
Calories	Protestant	Roman Catholic	Jewish	Mixed	Other or None
Meals - % from					
Snacks - % from					
Eaten Alone				.073059	
Eaten with All of Family					
Eaten with Some of Family					
Eaten with Friends					
Eaten at Home					
Eaten at School					
Eaten Elsewhere					
Protein					
Meals - % from					
Snacks - % from					
Eaten Alone					
Eaten with All of Family					
Eaten with Some of Family					
Eaten with Friends					
Eaten at Home					
Eaten at School					
Eaten Elsewhere					

TABLE B3

Relationships (r values) Between the Major Food Purchaser and Preparer in Families of Subjects and Socio-Economic Variables Determined in this Study[a]

	Age	Grade	Sex[b]	Color[c]
Major Food Purchaser				
Mother	-.078601			
Mother & Self	.091016	.128456	.120443	
Mother, Self & Others				
Mother & Father		-.071197		
Father			-.078547	
Self	.086455	.087208		
Self & Others Except Mother				
Grandmother				
Other	.074574			
Major Food Preparer				
Mother	-.069279		-.184412	
Mother & Self			.231507	
Mother, Self & Others				
Mother & Father				
Father				
Self			.204575	
Self & Others Except Mother				
Grandmother				
Other			-.124775	

[a]All figures presented were highly significant; r = .088, significant at the 1% level of probability; r = .067, significant at the 5% level of probability. N = 911.

[b]Male subjects were coded (1); female subjects were coded (2).

[c]White subjects were coded (1); non-white subjects were coded (2).

TABLE B3--Continued

	# of Illnesses	Rheumatic Fever[d]	Pneumonia[d]	Bronchitis[d]	Mononucleosis[d]
Major Food Purchaser					
Mother					
Mother & Self	.075944				
Mother, Self & Others					
Mother & Father					
Father					
Self		-.087877			
Self & Others Except Mother	.093703	-.137791	-.149045		
Grandmother					
Others					
Major Food Preparer					
Mother					
Mother & Self					
Mother, Self & Others		-.134851			
Mother & Father					
Father					
Self	.105828				
Self & Others Except Mother					
Grandmother			-.088325		
Others					

[d]Subjects who indicated that they had had these illnesses within the past five years were coded (1); all others were coded (2).

TABLE B3--Continued

	Subject's Work Hrs/Week	Father's Age	Father's Education	Mother's Age	Mother's Work Hrs/Wk	# of Moves	# of Siblings
Major Food Purchaser							
Mother	-.082381	-.095644	.109588		-.109918		
Mother & Self							
Mother, Self & Others					.088310		
Mother & Father			-.070070		.080948		
Father	.139431	.075773	-.072430				
Self							
Self & Others Except Mother							
Grandmother							
Others	.080675						
Major Food Preparer							
Mother					-.283326		
Mother & Self							
Mother, Self & Others					.084350		.072180
Mother & Father							
Father					.118347		
Self					.226290		
Self & Others Except Mother					.115356		.083800
Grandmother						.185864	
Others	.098407						

TABLE B3--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
Major Food Purchaser					
Mother					
Mother & Self					
Mother, Self & Others					
Mother & Father				.077795	
Father					
Self		.088124			
Self & Others Except Mother					
Grandmother					
Others					.084360
Major Food Preparer					
Mother	.069854				
Mother & Self					
Mother, Self & Others					
Mother & Father					.078100
Father					
Self	-.069884				
Self & Others Except Mother					
Grandmother		.086293		.077510	
Others					

TABLE B3--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
Major Food Purchaser					
Mother					
Mother & Self					
Mother, Self & Others					
Mother & Father					
Father					
Self					
Self & Others Except Mother					.096104
Grandmother					
Others		.096081			
Major Food Preparer					
Mother	.069629				-.089169
Mother & Self					.127357
Mother, Self & Others					
Mother & Father					
Father					
Self					.086809
Self & Others Except Mother					
Grandmother					
Others		.120535			

TABLE B3--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
Major Food Purchaser						
Mother	.085607		-.095956			
Mother & Self						
Mother, Self & Others						
Mother & Father						
Father		-.078845				
Self						
Self & Others Except Mother			.098087			
Grandmother						
Others						
Major Food Preparers						
Mother				-.091857		
Mother & Self			-.074870			
Mother, Self & Others		.088909				
Mother & Father						
Father						
Self						
Self & Others Except Mother						
Grandmother						
Others						

TABLE B3--Continued

	Family Religion				
	Protestant	Roman Catholic	Jewish	Mixed	Other or None
Major Food Purchaser					
Mother	.076527	-.079556			
Mother & Self					
Mother, Self & Others					
Mother & Father		.082006			
Father			.072394		
Self					
Self & Others Except Mother					
Grandmother					
Others					
Major Food Preparers					
Mother					
Mother & Self			.078671		
Mother, Self & Others					
Mother & Father					
Father					
Self					
Self & Others Except Mother					
Grandmother					
Others					

TABLE B4

Relationships (r values) Between Attitudes Towards Selected Foods and Socio-Economic Variables Determined in this Study[a]

	Age	Grade	Sex[b]	Color[c]
French Fried Potatoes				
Like Very Much				.087336
Like Slightly				-.085580
Neither Like Nor Dislike				
Dislike Slightly				
Dislike Very Much				
Unfamiliar With				
Lasagne				
Like Very Much		.070982	.153762	-.074611
Like Slightly				
Neither Like Nor Dislike			-.104867	
Dislike Slightly				
Dislike Very Much			.071871	.070804
Unfamiliar With		-.115917	-.088935	.098901
Chili Con Carne				
Like Very Much				.134525
Like Slightly				
Neither Like Nor Dislike				-.095354
Dislike Slightly				
Dislike Very Much		-.078190		
Unfamiliar With				

[a]All figures presented were highly significant; r = .088, significant at the 1% level of probability; r = .067, significant at the 5% level of probability. N = 911.

[b]Male subjects were coded (1); female subjects were coded (2).

[c]White subjects were coded (1); non-white subjects were coded (2).

TABLE B4--Continued

	# of Illnesses	Rheumatic Fever[d]	Pneumonia[d]	Bronchitis[d]	Mono-nucleosis[d]
French Fried Potatoes					
Like very much			.090693		
Like slightly					
Neither like nor dislike					-.074027
Dislike slightly			-.116190		
Dislike very much			-.088325		
Unfamiliar with					
Lasagne					
Like very much					
Like slightly		-.097370			
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Chili con carne					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

[d]Subjects who indicated that they had these illnesses within the past five years were coded (1); all others were coded (2).

TABLE B4--Continued

	Subject's Work Hrs/Week	Father's Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves	# of Siblings
French Fried Potatoes							
Like very much			-.092027				
Like slightly			.100717				
Neither like nor dislike							
Dislike slightly							
Dislike very much		-.104282		-.098230			
Unfamiliar with							
Lasagne							
Like very much			.181208				
Like slightly							
Neither like nor dislike							
Dislike slightly							
Dislike very much		-.089972		-.107035			
Unfamiliar with			-.216257			-.079786	
Chili Con Carne							
Like very much				-.069591		.090893	.074461
Like slightly							
Neither like nor dislike							
Dislike slightly							
Dislike very much							
Unfamiliar with							

TABLE B4--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
French Fried Potatoes					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Lasagne					
Like very much	.081574		.089457		
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with	-.141968	.076624	-.082609		
Chili Con Carne					
Like very much					
Like slightly					
Neither like nor dislike		.096975			
Dislike slightly					
Dislike very much					
Unfamiliar with	-.083657				

TABLE B4--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
French Fried Potatoes					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Lasagne					
Like very much	.072981	-.105295			
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with	.083390	.114816			
Chili Con Carne					
Like very much					.085874
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with				.110676	

TABLE B4--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
French Fried Potatoes						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with						
Lasagne						
Like very much						.069252
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with						
Chili Con Carne						
Like very much			.077878	-.085188		.079457
Like slightly						
Neither like nor dislike			-.084899			-.095483
Dislike slightly						
Dislike very much						
Unfamiliar with						

TABLE B4--Continued

	Family Religion				
	Protestant	Roman Catholic	Jewish	Mixed	Other or None
French Fried Potatoes					
Like very much					
Like slightly					
Neither like nor dislike	-.083211				
Dislike slightly				.074291	
Dislike very much				.121870	
Unfamiliar with					
Lasagne					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Chili Con Carne					
Like very much			.080577		
Like slightly					
Neither like nor dislike					
Dislike slightly					-.069546
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Age	Grade	Sex[b]	Color[c]
Chop Suey				
Like very much			.099344	
Like slightly				
Neither like nor dislike				
Dislike slightly				
Dislike very much				
Unfamiliar with				.085718
Fried Calves' Liver				
Like very much				
Like slightly				
Neither like nor dislike			-.070918	
Dislike slightly			-.070744	
Dislike very much			.080042	
Unfamiliar with				
Sauerkraut				
Like very much				
Like slightly				
Neither like nor dislike				
Dislike slightly	-.077417			
Dislike very much				
Unfamiliar with				
Pizza				
Like very much				-.129761
Like slightly				
Neither like nor dislike				.120027
Dislike slightly				
Dislike very much				.140834
Unfamiliar with				

TABLE B4--Continued

	# of Illnesses	Rheumatic Fever[d]	Pneumonia[d]	Bronchitis[d]	Mono-nucleosis[d]
Chop Suey					
Like very much	.071386				
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Fried Calves' Liver					
Like very much					
Like slightly				-.079723	
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Sauerkraut					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Pizza					
Like very much	.082675				
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Subject's Work Hrs/Week	Father's Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves	# of Siblings
Chop Suey							
Like very much							
Like slightly			.086226				
Neither like nor dislike							
Dislike slightly							
Dislike very much				-.071428			
Unfamiliar with			-.091253				
Fried Calves' Liver							
Like very much	.089793						.102062
Like slightly			.085410				
Neither like nor dislike							
Dislike slightly							
Dislike very much							
Unfamiliar with							
Sauerkraut							
Like very much							
Like slightly							
Neither like nor dislike							
Dislike slightly							
Dislike very much							
Unfamiliar with							
Pizza							
Like very much							
Like slightly							
Neither like nor dislike							
Dislike slightly							
Dislike very much				-.080467			.094459
Unfamiliar with							

TABLE B4--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
Chop Suey					
Like very much		-.086391	.092206		
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Fried Calves' Liver					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much			.087631		
Unfamiliar with				.075271	
Sauerkraut					
Like very much					
Like slightly					-.082807
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Pizza					
Like very much					-.092535
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
Chop Suey					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with		.083700			
Fried Calves' Liver					
Like very much					.132628
Like slightly					
Neither like nor dislike			.069703		
Dislike slightly					
Dislike very much					
Unfamiliar with					
Sauerkraut					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Pizza					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
Chop Suey						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with						
Fried Calves' Liver						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly			.073111			
Dislike very much						
Unfamiliar with						
Sauerkraut						
Like very much						
Like slightly	-.073088		-.069388			
Neither like nor dislike						-.069428
Dislike slightly						
Dislike very much						
Unfamiliar with						
Pizza						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with						

TABLE B4--Continued

	Family Religion				
	Protestant	Roman Catholic	Jewish	Mixed	Other or None
Chop Suey					
Like very much			.079347		
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					.073041
Fried Calves' Liver					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Sauerkraut					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Pizza					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Age	Grade	Sex[b]	Color[c]
Fried Scallops				
Like very much				-.070241
Like slightly				
Neither like nor dislike				
Dislike slightly				
Dislike very much				
Unfamiliar with			.128526	
Cooked Spinach				
Like very much				
Like slightly				.081686
Neither like nor dislike				
Dislike slightly				
Dislike very much				-.070241
Unfamiliar with				
Pancakes				
Like very much		-.070175	-.175872	.071561
Like slightly				
Neither like nor dislike			.089194	
Dislike slightly			.073268	
Dislike very much			.092329	
Unfamiliar with				
Spaghetti w/tomato & meat sauce				
Like very much				
Like slightly				
Neither like nor dislike				
Dislike slightly				
Dislike very much				.107115
Unfamiliar with				.072205

TABLE B4--Continued

	# of Illnesses	Rheumatic Fever[d]	Pneumonia[d]	Bronchitis[d]	Mono-nucleosis[d]
Fried Scallops					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Cooked Spinach					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with			-.089396		
Pancakes					
Like very much					.077715
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Spaghetti w/tomato & meat sauce					
Like very much					
Like slightly			-.079273		
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Subject's Work Hrs/Week	Father's Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves	# of Siblings
Fried Scallops							
Like very much	.079324						
Like slightly							
Neither like nor dislike							
Dislike slightly							
Dislike very much							
Unfamiliar with			-.105906				
Cooked Spinach							
Like very much							
Like slightly							
Neither like nor dislike							
Dislike slightly			.099372				
Dislike very much			-.087176				
Unfamiliar with				.071455			
Pancakes							
Like very much							.085771
Like slightly		.070774					-.099789
Neither like nor dislike							
Dislike slightly	.103433						
Dislike very much							
Unfamiliar with							
Spaghetti w/tomato & meat sauce							
Like very much							
Like slightly							
Neither like nor dislike							
Dislike slightly							
Dislike very much							
Unfamiliar with							

TABLE B4--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
Fried Scallops					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with		.115220			
Cooked Spinach					
Like very much					
Like slightly					
Neither like nor dislike				.095517	
Dislike slightly	.083381				
Dislike very much	-.085044				
Unfamiliar with	-.071113				
Pancakes					
Like very much					
Like slightly					
Neither like nor dislike		.091800			
Dislike slightly					
Dislike very much					
Unfamiliar with					
Spaghetti w/tomato & meat sauce					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
Fried Scallops					
Like very much					
Like slightly			.080865		
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Cooked Spinach					
Like very much					
Like slightly					
Neither like nor dislike		-.083307			
Dislike slightly					
Dislike very much					
Unfamiliar with					
Pancakes					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly			.087010		
Dislike very much					
Unfamiliar with					
Spaghetti w/tomato & meat sauce					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
Fried Scallops						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						.072044
Unfamiliar with				.087480		
Cooked Spinach						
Like very much						.101985
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much			-.088218			-.092834
Unfamiliar with						
Pancakes						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with		.088541			.090869	
Spaghetti w/tomato & meat sauce						
Like very much						
Like slightly						
Neither like nor dislike	.071948					
Dislike slightly						
Dislike very much						
Unfamiliar with			.069243			

TABLE B4--Continued

	Family Religion				
	Protestant	Roman Catholic	Jewish	Mixed	Other or None
Fried Scallops					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					.084950
Dislike very much				.111113	
Unfamiliar with					
Cooked Spinach					
Like very much					
Like slightly	.085828				-.076979
Neither like nor dislike					
Dislike slightly					
Dislike very much	-.102043	.083276			
Unfamiliar with					
Pancakes					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Spaghetti w/tomato & meat sauce					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly	-.072164		.080760		
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Age	Grade	Sex[b]	Color[c]
Cooked Cauliflower				
Like very much			.085761	
Like slightly				
Neither like nor dislike				
Dislike slightly				
Dislike very much				
Unfamiliar with				.130284
Cooked Beets				
Like very much			.092508	
Like slightly				
Neither like nor dislike				
Dislike slightly				
Dislike very much				
Unfamiliar with		-.073064		.150601
Chocolate Cake				
Like very much				
Like slightly				
Neither like nor dislike				
Dislike slightly				.098788
Dislike very much				
Unfamiliar with				
Baked Custard				
Like very much				
Like slightly				
Neither like nor dislike				
Dislike slightly			-.069437	
Dislike very much			.097732	
Unfamiliar with				

TABLE B4--Continued

	# of Illnesses	Rheumatic Fever[d]	Pneumonia[d]	Bronchitis[d]	Mono-nucleosis[d]
Cooked Cauliflower					
Like very much					
Like slightly				-.081654	
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Cooked Beets					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Chocolate Cake					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly		-.146483			
Dislike very much					
Unfamiliar with					
Baked Custard					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Subject's Work Hrs/Week	Father's Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves	# of Siblings
Cooked Cauliflower							
Like very much							
Like slightly			.091628				
Neither like nor dislike							
Dislike slightly							
Dislike very much			-.082812				
Unfamiliar with			-.100933				
Cooked Beets							
Like very much							
Like slightly							
Neither like nor dislike							
Dislike slightly							
Dislike very much							
Unfamiliar with							.069287
Chocolate Cake							
Like very much							
Like slightly							
Neither like nor dislike				.073951			
Dislike slightly					.071962		
Dislike very much				-.071638			
Unfamiliar with							
Baked Custard							
Like very much					.069475		
Like slightly							
Neither like nor dislike				.069969			
Dislike slightly							
Dislike very much				-.092399			
Unfamiliar with							

TABLE B4--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
Cooked Cauliflower					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with	-.107605				
Cooked Beets					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with	-.077437				
Chocolate Cake					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much		.071564			
Unfamiliar with					
Baked Custard					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with			.099800		

TABLE B4--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
Cooked Cauliflower					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with				.091844	
Cooked Beets					
Like very much					
Like slightly				.081989	
Neither like nor dislike					
Dislike slightly	.091183				
Dislike very much					
Unfamiliar with					
Chocolate Cake					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with	.089300				
Baked Custard					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much		.081054			
Unfamiliar with					

TABLE B4--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
Cooked Cauliflower						
Like very much						
Like slightly						
Neither like nor dislike		.070808				
Dislike slightly						
Dislike very much						
Unfamiliar with						
Cooked Beets						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with				-.074050		
Chocolate Cake						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with						
Baked Custard						
Like very much				-.071178		
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with						

TABLE B4--Continued

	Family Religion				
	Protestant	Roman Catholic	Jewish	Mixed	Other or None
Cooked Cauliflower					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly			.105945		
Dislike very much					
Unfamiliar with					
Cooked Beets					
Like very much	.070820	-.089113			
Like slightly					
Neither like nor dislike					
Dislike slightly				.078532	
Dislike very much		.083021			
Unfamiliar with					
Chocolate Cake					
Like very much	.078534	-.080324			
Like slightly					
Neither like nor dislike	-.093319	.100377			
Dislike slightly					
Dislike very much					
Unfamiliar with					.111973
Baked Custard					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Age	Grade	Sex[b]	Color[c]
Whole Milk				
Like very much			-.189810	
Like slightly			.099346	
Neither like nor dislike			.081438	
Dislike slightly				
Dislike very much			.116018	
Unfamiliar with				
Cola Beverages				
Like very much				
Like slightly				
Neither like nor dislike				
Dislike slightly				
Dislike very much				
Unfamiliar with				
Hard-Cooked Eggs				
Like very much				
Like slightly				
Neither like nor dislike				
Dislike slightly				
Dislike very much			.083927	
Unfamiliar with				

TABLE B4--Continued

	# of Illnesses	Rheumatic Fever[d]	Pneumonia[d]	Bronchitis[d]	Mono-nucleosis[d]
Whole Milk					
Like very much		-.072250			
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Cola Beverages					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Hard-Cooked Eggs					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Subject's Work Hrs/Week	Father's Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves	# of Siblings
Whole Milk							
Like very much			-.074506				
Like slightly	-.070975						
Neither like nor dislike							
Dislike slightly							
Dislike very much							
Unfamiliar with							
Cola Beverages							
Like very much					.086544		
Like slightly							
Neither like nor dislike							
Dislike slightly							
Dislike very much					-.083256		
Unfamiliar with							
Hard-Cooked Eggs							
Like very much							
Like slightly			-.078062				.075980
Neither like nor dislike	-.103656					.071392	-.083195
Dislike slightly							
Dislike very much					-.073775		
Unfamiliar with							

TABLE B4--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
Whole Milk					
Like very much					-.084550
Like slightly					
Neither like nor dislike					
Dislike slightly			.076522		
Dislike very much			.074871		
Unfamiliar with					.076633
Cola Beverages					
Like very much	-.082317				
Like slightly	.079658				
Neither like nor dislike					
Dislike slightly					
Dislike very much	.069988				
Unfamiliar with					
Hard-Cooked Eggs					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
Whole Milk					
Like very much					
Like slightly					
Neither like nor dislike	-.072422				
Dislike slightly					
Dislike very much					
Unfamiliar with					
Cola Beverages					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Hard-Cooked Eggs					
Like very much					.075494
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
Whole Milk						
Like very much						
Like slightly						
Neither like nor dislike						-.071456
Dislike slightly		.098419				
Dislike very much						
Unfamiliar with						
Cola Beverages						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with		.088541			.090869	
Hard-Cooked Eggs						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with						

TABLE B4--Continued

	Family Religion				
	Protestant	Roman Catholic	Jewish	Mixed	Other or None
Whole Milk					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Cola Beverages					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					
Hard-Cooked Eggs					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with	-.080034				

TABLE B4--Continued

	Age	Grade	Sex[b]	Color[c]
Pork Chops				
Like very much				.081601
Like slightly				-.077095
Neither like nor dislike			.072482	
Dislike slightly				
Dislike very much				
Unfamiliar with				
Oatmeal				
Like very much				
Like slightly				
Neither like nor dislike				
Dislike slightly				
Dislike very much			.132472	
Unfamiliar with				.091782

TABLE B4--Continued

	# of Illnesses	Rheumatic Fever[d]	Pneumonia[d]	Bronchitis[d]	Mono-nucleosis[d]
Pork Chops					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly				-.124390	
Dislike very much					
Unfamiliar with	.096040		-.105216		
Oatmeal					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Subject's Work Hrs/Week	Father's Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves	# of Siblings
Pork Chops							
Like very much							
Like slightly							
Neither like nor dislike							
Dislike slightly			.079037				
Dislike very much				-.071560			
Unfamiliar with				.088256			
Oatmeal							
Like very much				-.070388			.072780
Like slightly							
Neither like nor dislike							
Dislike slightly		.070327		.079257			
Dislike very much							
Unfamiliar with							

TABLE B4--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
Pork Chops					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly				.080302	
Dislike very much					
Unfamiliar with					
Oatmeal					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
Pork Chops					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly		-.081907			
Dislike very much					
Unfamiliar with					
Oatmeal					
Like very much					.080216
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B4--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
Pork Chops						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with						
Oatmeal						
Like very much						
Like slightly						
Neither like nor dislike						
Dislike slightly						
Dislike very much						
Unfamiliar with						

TABLE B4--Continued

	Family Religion				
	Protestant	Roman Catholic	Jewish	Mixed	Other or None
Pork Chops					
Like very much					
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with				.143125	
Oatmeal					
Like very much					.070198
Like slightly					
Neither like nor dislike					
Dislike slightly					
Dislike very much					
Unfamiliar with					

TABLE B5

Relationships (r values) Between Percentage Intake of the RDA of Various Nutrients, Weight-Height Ratio, and Consumption of Vitamin Preparations, and Socio-Economic Variables Determined in this Study[a]

	Age	Grade	Sex[b]	Color[c]
Percentage Intake of RDA for				
Calories			-.292841	
Protein			-.425972	
Calcium	-.075600		-.380751	
Iron			-.416867	
Vitamin A			-.121555	
Thiamin			-.272051	
Riboflavin			-.433576	
Niacin Equivalents			-.209566	.078906
Ascorbic Acid			-.146185	
Weight-Height Category[d]	.084200		.069412	
Vitamin Preparation Consumption[e]				.079566

[a]All figures presented were highly significant; r = .088, significant at the 1% level of probability; r = .067 significant at the 5% level of probability. N = 911.

[b]Male subjects were coded (1); female subjects were coded (2).

[c]White subjects were coded (1); non-white subjects were coded (2).

[d]Each subject was placed in a category from (1) Underweight to (6) Obese.

[e]Those subjects who indicated that they took a multi-vitamin preparation on a regular basis were coded (1); all others were coded (2).

TABLE B5--Continued

	# of Illnesses	Rheumatic Fever[f]	Pneumonia[f]	Bronchitis[f]	Mono-nucleosis[f]
Percentage Intake of RDA for					
Calories			-.072779		
Protein			-.076472		
Calcium			-.098210		
Iron			-.087571		
Vitamin A					
Thiamin			-.096485		
Riboflavin			-.122712		
Niacin Equivalents					
Ascorbic Acid			-.107789		
Weight-Height Category					.085722
Vitamin Preparation Consumption					

[f] Subjects who indicated that they had had these illnesses within the past five years were coded (1); all others were coded (2).

TABLE B5--Continued

	Subject's Work Hrs/Week	Age	Father's Education	Mother's Age	Mother's Work Hrs/Week	# of Moves	# of Siblings
Percentage Intake of RDA for							
Calories			.100845		-.070935		
Protein			.141167				
Calcium			.135401				
Iron			.119870		-.085958		
Vitamin A			.113484				
Thiamin	.093266				-.077337		
Riboflavin			.126541				
Niacin Equivalents	.072023		.071811				
Ascorbic Acid			.174332		-.072789	.085106	
Weight-Height Category			-.168881		.096810		
Vitamin Preparation Consumption	.106278		-.107574		.090999		.087879

TABLE B5--Continued

	Father's Occupation				
	Professional	Farmer	Manager	Clerical	Sales
Percentage Intake of RDA for					
Calories					
Protein					
Calcium	.070225				
Iron					
Vitamin A	.070163				
Thiamin					
Riboflavin	.077902				
Niacin Equivalents					
Ascorbic Acid	.134153				
Weight-Height Category	-.134725				
Vitamin Preparation Consumption	-.116509				

TABLE B5--Continued

	Father's Occupation				
	Craftsman	Operative	Service	Farm Laborer	Other Laborer
Percentage Intake of RDA for					
Calories			-.073621	.088813	
Protein					
Calcium					
Iron			-.070666		
Vitamin A					
Thiamin					
Riboflavin					
Niacin Equivalents					
Ascorbic Acid					
Weight-Height Category		.126190			
Vitamin Preparation Consumption		.110328			

TABLE B5--Continued

	Father's Origin			Mother's Origin		
	Michigan	North Central	Other	Michigan	North Central	Other
Percentage Intake of RDA for						
Calories		.069010				.076708
Protein						
Calcium		.070971				
Iron		.069045				.073380
Vitamin A						
Thiamin						
Riboflavin						
Niacin Equivalents						
Ascorbic Acid						
Weight-Height Category						
Vitamin Preparation Consumption						

TABLE B5--Continued

	Family Religion				
	Protestant	Roman Catholic	Jewish	Mixed	Other or None
Percentage Intake of RDA for					
Calories	.078554				
Protein					
Calcium					
Iron					
Vitamin A					
Thiamin					
Riboflavin					
Niacin Equivalents					
Ascorbic Acid	.096635				
Weight-Height Category					.095164
Vitamin Preparation Consumption					

APPENDIX C

Relationships (r values) Between Food Habit and Nutritional Characteristics Derived from the Study and Selected 1960 United States Census Socio-Economic Variables

TABLE C1

Relationship (r values) Between Number of Servings of Food Groups and Selected 1960 U. S. Census Socio-Economic Variables[a,b]

	Number of Servings of				
	Milk and Milk Products	Fresh Fluid Milk	Protein Foods	Vegetables	Fruits
% White Population		.082030	-.091483	-.109375	
% Black Population		-.082718	.091895	.110628	
% Foreign Stock					
% UK & Ireland					
% Norway & Sweden	.081660				.085872
% Germany					
% Poland	-.094496				-.095071
% Czechoslovakia	.099357	.134922			
% Austria					.120915
% Hungary		.080299			
% USSR	.102941				.163571
% Italy					
% Canada					.139513
% Mexico					
Population/Household					
Median School Years	.106284			-.079716	.191932
Median Family Income	.079622				.147047
% Civilian Labor Force Unemployed-Male				.109335	-.123220
% Civilian Labor Force Unemployed-Female	-.100927	-.116500		.129312	-.111130

[a]All figures given were highly significant; r = 0.101, significant at the 1% level of probability; r = .078, significant at the 5% level of probability. N = 648.

[b]Calculated from: U.S. Bureau of the Census, U.S. Census of Population and Housing: 1960, Census Tracts. Final Report PHC(1)-73, U.S. Government Printing Office, Washington, D.C., 1962.

TABLE C1--Continued

	Number of Servings of			
	Grains	Fats	Sugars & Sweets	Soft Drinks
% White Population			-.140116	-.082083
% Black Population			.143143	.084764
% Foreign Stock			.079320	
% UK & Ireland			.132669	.079856
% Norway & Sweden				
% Germany				
% Poland			.126848	.095747
% Czechoslovakia				
% Austria				-.088935
% Hungary				
% USSR			-.094358	-.131370
% Italy				
% Canada				
% Mexico				
Population/Household		.078035	-.157588	-.125940
Median School Years			-.131998	-.151255
Median Family Income				-.109383
% Civilian Labor Force Unemployed-Male			.134804	.141434
% Civilian Labor Force Unemployed-Female			.143667	.137861

TABLE C1--Continued

	Milk and Milk Products	Fresh Fluid Milk	Protein Foods	Vegetables	Fruits
Occupation-Males					
% Professional	.081175				.199094
% Managerial	.085388				.132469
% Clerical					
% Sales	.079534				.116119
% Craftsmen					-.128081
% Operatives	-.082806				-.175485
% Private Household				.110050	
% Service				.130140	
% Laborers	-.079369	-.085876	.084006	.084589	.090699
Occupation-Females					
% Professional	.098213				.161136
% Managerial		.079293			
% Clerical				-.093713	
% Sales					
% Craftsmen		-.110642		.078247	
% Operatives	-.122847	-.097679		.091894	-.166747
% Private Household					
% Service					
% Laborers					

TABLE C1--Continued

	Number of Servings of			
	Grains	Fats	Sugars & Sweets	Soft Drinks
Occupation-Male				
% Professional				-.128885
% Managerial				-.130229
% Clerical		.090644		
% Sales				-.087536
% Craftsmen				
% Operatives				.109217
% Private Household				.078044
% Service			.093126	.115451
% Laborers			.119940	.093032
Occupation-Females				
% Professional				-.113077
% Managerial	.098883			
% Clerical				
% Sales				
% Craftsmen				
% Operatives				.115225
% Private Household				
% Service				.087046
% Laborers				

TABLE C1--Continued

	Number of Servings of				
	Milk and Milk Products	Fresh Fluid Milk	Protein Foods	Vegetables	Fruits
Housing					
% Owner Occupied-White			-.081351	-.084415	
% Owner Occupied-Nonwhite		-.089685	.089112	.115567	
% Renter Occupied-White					
% Renter Occupied-Nonwhite			.094288	.096028	
% Sound Units					.126182
% Deteriorating Units				.100822	-.130694
% Dilapidated Units					
Median Rooms/Unit					
Median Persons/Room		.081188			
Persons/Room					
% 0.50 or less		-.095531			
% 0.51-0.75					.127460
% 0.76-1.00			-.092928		
% 1.01 or more					-.081949

TABLE C1--Continued

	Number of Servings of			
	Grains	Fats	Sugars & Sweets	Soft Drinks
Housing				
% Owner Occupied-White			-.137282	-.095402
% Owner Occupied-Nonwhite			.143439	.084694
% Renter Occupied-White		-.079196	.130236	.118235
% Renter Occupied-Nonwhite			.129185	
% Sound Units			-.088012	-.098657
% Deteriorating Units			.112305	.106402
% Dilapidated Units				
Median Rooms/Unit			.110206	
Median Persons/Room		.092964	-.184626	-.135908
Persons/Room				
% 0.50 or less		-.080616	.191862	.092300
% 0.51-0.75			-.121620	-.113740
% 0.76-1.00		.091145	-.147318	
% 1.01 or more				

TABLE C2

Relationship (r values) Between Percentages of Calories and Protein Consumed from Meals, and in Different Environments, and Selected 1960 U.S. Census Socio-Economic Variables[a,b]

	% Calories from Meals	% Protein from Meals	% Calories at Home	% Calories at School
% White Population				
% Black Population				
% Foreign Stock				
% UK and Ireland				
% Norway & Sweden			.079937	
% Germany				
% Poland	-.080353		-.082129	
% Czechoslovakia				
% Austria				
% Hungary				
% USSR				
% Italy				
% Canada			.091117	-.085441
% Mexico				-.086734
Population/Household				.093518
Median School Years	.084366		.097460	
Median Family Income			.078667	
% Civilian Labor Force Unemployed-Male				
% Civilian Labor Force Unemployed-Female				

[a]All figures given were highly significant; r = 0.101, significant at the 1% level of probability; r = 0.078, significant at the 5% level of probability.

[b]Calculated from: U.S. Bureau of the Census, U.S. Census of Population and Housing: 1960, Census Tracts. Final Report PHC(1)-73, U.S. Government Printing Office, Washington, D.C., 1962.

TABLE C2--Continued

	% Calories Elsewhere	% Protein at Home	% Protein at School	% Protein Elsewhere
% White Population				
% Black Population				
% Foreign Stock				
% UK & Ireland				
% Norway & Sweden				
% Germany				
% Poland	.089648			
% Czechoslovakia			.078406	
% Austria				
% Hungary				
% USSR				
% Italy				
% Canada		.079899	-.106885	
% Mexico				
Population/Household			.110500	
Median School Years	-.082869			
Median Family Income				
% Civilian Labor Force Unemployed-Male				
% Civliian Labor Force Unemployed-Female				

TABLE C2--Continued

	% Calories from Meals	% Protein from Meals	% Calories at Home	% Calories at School
Occupation-Males				
% Professional			.109692	
% Managerial				
% Clerical				
% Sales				
% Craftsmen			-.101792	.079352
% Operatives			-.097724	
% Private Household				
% Service				
% Laborers				
Occupation-Females				
% Professional			.119045	
% Managerial				
% Clerical				
% Sales				
% Craftsmen				
% Operatives			-.098295	
% Private Household				
% Service				
% Laborers				

TABLE C2--Continued

	% Calories Elsewhere	% Protein at Home	% Protein at School	% Protein Elsewhere
Occupation-Males				
% Professional		.086304		
% Managerial	-.080895			
% Clerical				
% Sales				
% Craftsmen		-.088763	.097002	
% Operatives				
% Private Household				
% Service				
% Laborers				
Occupation-Females				
% Professional		.104245		
% Managerial				
% Clerical				
% Sales				
% Craftsmen				
% Operatives				
% Private Household				
% Service				
% Laborers				

TABLE C2--Continued

	% Calories from Meals	% Protein from Meals	% Calories at Home	% Calories at School
Housing				
% Owner Occupied-White				
% Owner Occupied-Nonwhite				
% Renter Occupied-White				-.087890
% Renter Occupied-Nonwhite				
% Sound Units				
% Deteriorating Units	-.094368			
% Dilapidated Units				
Median Rooms/Unit				
Median Persons/Room				.091691
Persons/Room				
% 0.50 or less				
% 0.51-0.75				
% 0.76-1.00				
% 1.01 or more				

TABLE C2--Continued

	% Calories Elsewhere	% Protein at Home	% Protein at School	% Protein Elsewhere
Housing				
% Owner Occupied-White				
% Owner Occupied-Nonwhite				
% Renter Occupied-White			-.079642	
% Renter Occupied-Nonwhite				
% Sound Units				
% Deteriorating Units				
% Dilapidated Units				
Median Rooms/Unit				
Median Persons/Room			.109356	
Persons/Room				
% 0.50 or less				
% 0.51-0.75				
% 0.76-1.00			.097094	
% 1.01 or more				

TABLE C3

Relationship (r values) Between Percentages of Calories and Protein Consumed with Different Groups, and Selected 1960 U.S. Census Socio-Economic Variables[a,b]

	% Calories Alone	% Calories With Entire Family	% Calories With Some of Family	% Calories With Friends
% White Population				
% Black Population				
% Foreign Stock		-.078956		
% UK & Ireland				
% Norway & Sweden				-.108278
% Germany				
% Poland				.118329
% Czechoslovakia				
% Austria	.076082			
% Hungary	.079000			
% USSR				-.084149
% Italy				
% Canada				-.111503
% Mexico				
Population/Household				
Median School Years	.086128			-.137145
Median Family Income				-.089157
% Civilian Labor Force Unemployed-Male				.107245
% Civilian Labor Force Unemployed Female				

[a]All figures given were highly significant; r = 0.101, significant at the 1% level of probability; r = 0.078, significant at the 5% level of probability. N = 648.

[b]Calculated from: U.S. Bureau of the Census, U.S. Census of Population and Housing: 1960, Census Tracts. Final Report PHC(1)-73, U.S. Government Printing Office, Washington, D.C., 1962.

TABLE C3--Continued

	% Protein Alone	% Protein With Entire Family	% Protein With Some of Family	% Protein With Friends
% White Population				
% Black Population				
% Foreign Stock				
% UK & Ireland				
% Norway & Sweden				-.079108
% Germany				
% Poland				
% Czechoslovakia				
% Austria				
% Hungary	.078347			
% USSR				
% Italy				
% Canada				-.110736
% Mexico				
Population/Household				
Median School Years	.088255			-.112075
Median Family Income				
% Civilian Labor Force Unemployed-Male				.085783
% Civilian Labor Force Unemployed-Female				

TABLE C3--Continued

	% Calories Alone	% Calories With Entire Family	% Calories with Some of Family	% Calories With Friends
Occupation-Males				
% Professional				-.132086
% Managerial				-.096711
% Clerical				
% Sales				-.105131
% Craftsmen				.109612
% Operatives	-.082953			.116886
% Private Household				
% Service				
% Laborers	-.079713			
Occupation-Females				
% Professional				-.130985
% Managerial				
% Clerical	.080022			
% Sales				
% Craftsmen				
% Operatives	-.098570			.113580
% Private Household				
% Service				
% Laborers				

TABLE C3--Continued

	% Protein Alone	% Protein With Entire Family	% Protein With Some of Family	% Protein With Friends
Occupation-Males				
% Professional				-.109232
% Managerial				
% Clerical				
% Sales				-.105255
% Craftsmen				.103833
% Operatives				.098091
% Private Household				
% Service				
% Laborers	-.082421			
Occupation-Females				
% Professional				-.120546
% Managerial				
% Clerical				
% Sales				
% Craftsmen				
% Operatives	-.089406			.088982
% Private Household				
% Service				
% Laborers				

TABLE C3--Continued

	% Calories Alone	% Calories With Entire Family	% Calories With Some of Family	% Calories With Friends
Housing				
% Owner Occupied-White				
% Owner Occupied-Nonwhite				.079345
% Renter Occupied-White				
% Renter Occupied-Nonwhite				
% Sound Units				
% Deteriorating Units				.078740
% Dilapidated Units				
Median Rooms/Unit				
Median Persons/Room				
Persons/Room				
% 0.50 or less				
% 0.51-0.75				
% 0.76-1.00				
% 1.01 or more				

TABLE C3--Continued

	% Protein Alone	% Protein With Entire Family	% Protein With Some of Family	% Protein With Friends
Housing				
% Owner Occupied-White				
% Owner Occupied-Nonwhite				
% Renter Occupied-White				
% Renter Occupied-Nonwhite				
% Sound Units				
% Deteriorating Units				
% Dilapidated Units				
Median Rooms/Unit				
Median Persons/Room				
Persons/Room				
% 0.50 or less				
% 0.51-0.75				
% 0.76-1.00				
% 1.01 or more				.082265

TABLE C4

Relationship (r values) Between the Percentage of the RDA Consumed of Various Nutrients and Weight-Height Ratios and Selected 1960 U.S. Census Socio-Economic Census Tract Variables[a,b]

	Percent of Recommended Dietary Allowances of				
Census Tract Variables	Calories	Protein	Calcium	Iron	Vitamin A
% White Population					
% Black Population					
% Foreign Stock					
% UK & Ireland					
% Norway & Sweden					
% Germany					
% Poland			-.083321		
% Czechoslovakia			.080241	-.083102	
% Austria					
% Hungary					
% USSR			.086049		
% Italy				-.090425	
% Canada					
% Mexico					
Population/Household					
Median School Years			.085261		
Median Family Income					
% Civilian Labor Force Unemployed-Male					
% Civilian Labor Force Unemployed-Female			-.096184		

[a] All figures presented are highly significant; r = 0.101, significant at the 1% level of probability; r = 0.078, significant at the 5% level of probability. N = 648.

[b] Calculated from: U.S. Bureau of the Census, U.S. Census of Population and Housing: 1960, Census Tracts. Final Report PHC(1)-73, U.S. Government Printing Office, Washington, D.C., 1962.

TABLE C4--Continued

Census Tract Variables	Percent of Recommended Dietary Allowance of				
	Thiamin	Riboflavin	Niacin	Ascorbic Acid	Weight/Height Ratio
% White Population					
% Black Population					
% Foreign Stock					
% UK & Ireland					
% Norway & Sweden			-.091194	.095206	-.100683
% Germany					
% Poland		-.078816			
% Czechoslovakia					
% Austria				.134380	
% Hungary				.095902	-.122527
% USSR				.143557	-.110220
% Italy					
% Canada					
% Mexico					
Population/Household					
Median School Years				.143524	-.118367
Median Family Income				.138570	-.109932
% Civilian Labor Force Unemployed-Male					.120798
% Civilian Labor Force Unemployed-Female					.081195

TABLE C4--Continued

	Percent of Recommended Dietary Allowances of				
	Calories	Protein	Calcium	Iron	Vitamin A
Occupation-Males					
% Professional					
% Managerial			.090288		
% Clerical					
% Sales					
% Craftsmen					
% Operatives			-.078773		
% Private Household					
% Service					
% Laborers					
Occupation-Females					
% Professional			.082949		
% Managerial	.083001		.083110		
% Clerical					
% Sales					
% Craftsmen					
% Operatives			-.106118		
% Private Household				.087611	
% Service					
% Laborers					

TABLE C4--Continued

Percent of Recommended Dietary Allowances of

	Thiamin	Riboflavin	Niacin	Ascorbic Acid	Weight/Height Ratios
Occupation-Males					
% Professional				.146482	-.113498
% Managerial		.078799		.119896	-.115030
% Clerical					
% Sales				.092422	-.141155
% Craftsmen				-.125663	.116681
% Operatives				-.137153	.104910
% Private Household					
% Service			.093488		.093258
% Laborers					
Occupation-Females					
% Professional				.126046	-.107511
% Managerial				.082994	
% Clerical					-.095369
% Sales					
% Craftsmen			.087242		
% Operatives			.089957	-.130266	.108537
% Private Household					
% Service					.092993
% Laborers			.082497		

TABLE C4--Continued

	Percent of Recommended Dietary Allowance of									
	Calories	Protein	Calcium	Iron	Vit. A	Thiamin	Riboflavin	Niacin	Ascorbic Acid	Weight/ Height Ratio
Housing										
% Owner-Occupied-White										
% Owner-Occupied-Nonwhite										
% Renter-Occupied-White										
% Renter-Occupied-Nonwhite										
% Sound Units									.110276	-.093040
% Deteriorating Units									-.113348	
% Dilapidated Units										.102940
Median Rooms/Unit										
Median Persons/Room										
Persons/Room										
% 0.50 or less										
% 0.51-0.75									.140286	-.092969
% 0.76-1.00										
% 1.01 or more										.100706

APPENDIX D

Relationships (r values) Between Food Habit and Nutritional Characteristics Derived from the Study and Selected 1960 United States Census City Block Data on Housing

TABLE D1

Relationship (r values) Between Number of Servings of Food Groups and Selected 1960 U.S. Census City Block Data on Housing[a,b]

	Milk	Protein Foods	Vegetables	Fruits	Grains	Fats	Sugars & Sweets
% Sound Housing Units - Total					.145882	.175025	
% Sound Housing Units with All Plumbing Facilities						.171077	
% Sound Housing Units Lacking Some or All Facilities			.139952				.159577
% Deteriorating Housing Units - Total						-.151091	
% Deteriorating Housing Units Lacking Some or all Facilities with Flush Toilets						-.179117	
% Deteriorating Housing Units Lacking Some or All Facilities. with No Flush Toilets							
% Dilapidated Housing Units						-.139691	
% Owner Occupied						.167936	
% Renter Occupied						-.145373	
% White Occupied						.153769	
% Nonwhite Occupied		.138802					
% 1.00 or Less Persons/Room					.149402		
% 1.01 or More Persons/Room							

[a]All figures given were highly significant; r = 0.181, significant at the 1% level of probability; r = 0.138, significant at the 5% level of probability. N = 211.

[b]Calculated from: U.S. Bureau of the Census, U.S. Census of Housing: 1960, Volume III City Blocks, Series HC(3), No. 210, U.S. Government Printing Office, Washington, D.C., 1961.

TABLE D2

Relationship (r values) Between Percentages of Calories and Protein Consumed Under a Variety of Conditions, and Selected U.S. Census City Block Data on Housing[a,b]

	% Calories At Meals	% Protein At Meals	% Calories Alone	% Calories With Entire Family	% Calories with Some of Family
% Sound Housing Units - Total					
% Sound Housing Units with All Plumbing Facilities					
% Sound Housing Units Lacking Some or All Facilities					
% Deteriorating Housing Units - Total					
% Deteriorating Housing Units Lacking Some or All Facilities with Flush Toilets					
% Deteriorating Housing Units Lacking Some or All Facilities with No Flush Toilets					
% Dilapidated Housing Units					
% Owner Occupied				-.173023	.162147
% Renter Occupied	-.141095			.142717	
% White Occupied					
% Nonwhite Occupied					
% 1.00 or Less Persons/Room					
% 1.01 or More Persons/Room					

[a]All figures given were highly significant; r = 0.181, significant at the 1% level of probability; r = 0.138, significant at the 5% level of probability. N = 211.

[b]Calculated from: U.S. Bureau of the Census, U.S. Census of Housing: 1960, Volume III City Blocks, Series HC(3), No. 210, U.S. Government Printing Office, Washington, D.C., 1961.

TABLE D2--Continued

	% Calories with Friends	% Protein Alone	% Protein with Entire Family	% Protein with Some of Family	Protein with Friends	% Calories at Home
% Sound Housing Units - Total						
% Sound Housing Units with All Plumbing Facilities						
% Sound Housing Units Lacking Some or All Facilities						
% Deteriorating Housing Units - Total						
% Deteriorating Housing Units Lacking Some or All Facilities with Flush Toilets						
% Deteriorating Housing Units Lacking Some or All Facilities with No Flush Toilets						
% Dilapidated Housing Units	.187867					
% Owner Occupied				.162967		
% Renter Occupied						
% White Occupied						
% Nonwhite Occupied						
% 1.00 or Less Persons/Room						
% 1.01 or More Persons/Room						

TABLE D2--Continued

	% Calories at School	% Calories Elsewhere	% Protein at Home	% Protein at School	% Protein Elsewhere
% Sound Housing Units - Total					
% Sound Housing Units with All Plumbing Facilities					
% Sound Housing Units Lacking Some or All Facilities					
% Deteriorating Housing Units - Total					
% Deteriorating Housing Units Lacking Some or All Facilities with Flush Toilets					
% Deteriorating Housing Units Lacking Some or All Facilities with No Flush Toilets	.156645				
% Dilapidated Housing Units					
% Owner Occupied					
% Renter Occupied	-.153522				
% White Occupied					
% Nonwhite Occupied					
% 1.00 or Less Persons/Room					
% 1.01 or More Persons/Room					

TABLE D3

Relationship (r values) Between the Percentage of the RDA Consumed of Various Nutrients and Selected 1960 U.S. Census City Block Housing Characteristics[a,b]

City Block Variables	Calories	Protein	Calcium	Iron	Vitamin A	Thiamin	Riboflavin	Niacin	Ascorbic Acid
% Sound Housing Units - Total	.146994	.144197						.154006	
% Sound Housing Units with All Plumbing Facilities									
% Sound Housing Units Lacking Some or All Facilities									
% Deteriorating Housing Units - Total									
% Deteriorating Housing Units Lacking Some or All Facilities with Flush Toilets									
% Deteriorating Housing Units Lacking Some or All Facilities with No Flush Toilets									
% Dilapidated Housing Units									
% Owner Occupied									
% Renter Occupied									
% White Occupied									
% Nonwhite Occupied				.176602	.186692			.154793	
% 1.00 or Less Persons/Room									
% 1.01 or More Persons/Room									

[a]All figures given were highly significant; r = 0.181, significant at the 1% level of probability; r = 0.138, significant at the 5% level of probability. N = 211.

[b]Calculated from: U.S. Bureau of the Census, U.S. Census of Housing: 1960, Volume III City Blocks, Series HC(3), No. 210, U.S. Government Printing Office, Washington, D.C., 1961.

BIBLIOGRAPHY

BIBLIOGRAPHY

Public Documents and Bulletins

Davenport, Elizabeth. Calculating the Nutritive Value of Diets. United States Department of Agriculture, Agricultural Research Service Bulletin 62-10-1, Hyattsville, Md. 1964.

Morgan, Agnes Fay (ed.). Nutritional Status, U.S.A. California Agricultural Experiment Station Bulletin 769, 1959.

National Academy of Sciences. Recommended Dietary Allowances, Seventh Revised Edition. Publication 1694, Washington, D.C. 1968.

National Academy of Sciences. Manual for the Study of Food Habits. National Research Council Bulletin 111, Washington, D.C., 1945.

Nutritive Value of Foods. Home and Garden Bulletin No. 72, United States Department of Agriculture, Washington, D.C., 1960.

U.S. Bureau of the Census. U.S. Census of Housing: 1960, Volume III, City Blocks. Series HC(3), No. 210, U.S. Government Printing Office, Washington, D.C., 1961.

U.S. Bureau of the Census. U.S. Census of Population and Housing: 1960, Census Tracts. Final Report PHC(1)-73, U.S. Government Printing Office, Washington, D.C., 1962.

U.S. Department of Health, Education, and Welfare, Highlights from the Ten-State Nutrition Survey, 1968-70. Nutrition Today 7 (No. 4):4, 1972.

Books

Blalock, H.S. Social Statistics. McGraw Hill: New York 1960.

Guthrie, Helen A. Introductory Nutrition, 2nd edition. Moshy: St. Louis, 1971.

McGlashan, N. D. (ed.) Medical Geography. Metheun: London, 1972.

Pyke, Magnus. Man and Food. McGraw Hill: New York, 1970.

Journal Articles

Allen, Donald E. et al., Nutrition, Family Commensality and Academic Performance among High School Youth. Journal of Home Economics 2:333, 1970.

Claman, A. D. and H. M. Bell. Pregnancy in the Very Young Teenager. American Journal of Obstetrics and Gynecology 90:350, 1964.

Dwyer, Johanna T., et al. Adolescent Attitudes Toward Weight and Appearance. Journal of Nutrition Education 1:14, 1969.

Eppright, E. S. and P. P. Swanson. Distribution of Calories in Diets of Iowa School Children. Journal of the American Dietetic Association 31:144, 1955.

Everson, Gladys J. Bases for Concern about Teenagers' Diets. Journal of the American Dietetic Association 36:17, 1960.

Foley, Donald L. Census Tracts and Urban Research. American Statistical Association Journal 48:733, 1953.

Garrell, Dale C. Adolescent Medicine. American Journal of Diseases of Children 109:314, 1965.

Hammar, S. L. The Role of the Nutritionist in an Adolescent Clinic. Children 13:217, 1966.

Hampton, Mary C. et al. Caloric and Nutrient Intakes of Teen-agers. Journal of the American Dietetic Association 50:385, 1967.

Heald, Felix P. Iron-Deficiency Anemia in Adolescent Girls. Postgraduate Medicine 27:104, 1960.

Hinton, Maxine A., et al. Eating Behavior and Dietary Intake of Girls 12 to 14 Years Old. Journal of the American Dietetic Association 43:223, 1963.

Hodges, Robert E. and W. A. Krehl. Nutritional Status of Teenagers in Iowa. American Journal of Clinical Nutrition 17:200, 1965.

Huenemann, Ruth L. Consideration of Adolescent Obesity as a Public Health Problem. U.S. Public Health Reports 83:491, 1968.

________., et al. Adolescent Food Practices Associated with Obesity. Federation Proceedings 25:4, 1966.

________., et al. Food and Eating Practices of Teen-Agers. Journal of the American Dietetic Association 53:17, 1968.

Johnson, M. L., et al. Relative Importance of Inactivity and Overeating in the Energy Balance of Obese High School Girls. American Journal of Clinical Nutrition 4:37, 1957.

Lactose Intolerance. Dairy Council Digest 42:31, 1971.

McElroy, J. and B. Taylor. Adolescents' Values in Selection of Food. Journal of Home Economics 58:651, 1966.

Moore, Margaret C., et al. Using Graduated Food Models in Taking Dietary Histories. Journal of the American Dietetic Association 51:447, 1967.

Rummel, R. J. Understanding Factor Analysis. Journal of Conflict Resolution 11:444, 1967.

Sargent, Dorothy W. Weight-Height Relationships of Young Men and Women. American Journal of Clinical Nutrition 13:318, 1963.

Spargo, John A., et al. Adolescent Obesity. Nutrition Today 1:2, 1966.

Spencer, J. E. Review of Eat Not This Flesh by F. Simoons, Geographical Review 52:630, 1962.

Spendler, Evelyn B. and Geraldine Archer. Teen-Agers Tell Us About their Nutrition. Journal of the American Dietetic Association 43:228, 1963.

Steele, Betty F., et al. Role of Breakfast and of Between-Meal Foods in Adolescents' Nutrient Intake. Journal of the American Dietetic Association 28:1054, 1952.

Wharton, Marion A. Nutritive Intake of Adolescents. Journal of the American Dietetic Association 42:306, 1963.

Young, Charlotte M., et al. A Comparison of Dietary Study Methods, II. Dietary History vs. Seven-Day Records vs. 24-Hour Recall. Journal of the American Dietetic Association 28:218, 1952.

Unpublished Materials

Leverton, Ruth M. "The Paradox of Teenage Nutrition." Paper read before the American Dietetic Association, Chicago, Illinois, August 14, 1967.

Malik, Johan Ara. "Historical Geography of Ingham County, Michigan." (Unpublished Ph.D. dissertation, Department of Geography, Michigan State University, 1960).

Santer, Richard Arthur. "A Historical Geography of Jackson, Michigan: A Study on the Changing Character of an American City 1829-1969." (Unpublished Ph.D. dissertation, Department of Geography, Michigan State University, 1970).