



FOOD CONSUMPTION STUDY OF A
RANDOMIZED SAMPLE OF TWENTY YOUNG
MARRIED STUDENT COUPLES OCCUPYING
LIVING QUARTERS ON MICHIGAN STATE
COLLEGE CAMPUS

Thesis for the Degree of M. S.
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Joan Audrey Johnson
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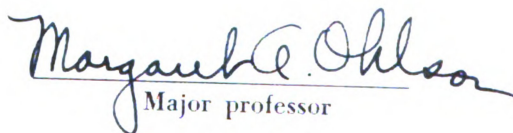
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OF TWENTY YOUNG MARRIED STUDENT COUPLES OCCUPYING
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By

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INTRODUCTION AND REVIEW OF LITERATURE

The problem of determining the caloric content of human diets has been of fundamental significance since early days, not only as the basis of the knowledge of nutrition, but in the history of science generally. The modern era of chemical advances is believed to have originated around 1770 through introduction by Lavoisier of the balance and the thermometer in clinical and biologic studies. The experiments performed by Lavoisier on animal and human subjects, led to the establishment of the principle that the combustion of foodstuffs resulted in the formation of carbon dioxide and water, with a simultaneous production of heat which was measurable by its effect on the temperature of a surrounding mass of water.

During the second half of the nineteenth century, the Munich school of physiologists, under the leadership of Voit and Rubner, showed that if studies were performed with sufficient care, the caloric content of ingested food minus the caloric equivalent of the urine and feces was strictly equivalent to the heat produced by the subject. This was taken as proof that the principle of the conservation of energy could be applied to life, and to man in

particular, and established the fact that there was no mysterious "vitalist force" at work in living organisms which would prevent the application of chemical thermodynamics to physiology, nutrition, or medicine. (1)

The advances in science that were being made by research workers in Europe, were introduced into the United States during the end of the 19th Century and the beginning of the 20th Century. The nutrition research in this country was greatly benefited by the studies of the fuel value of the important foods in American dietaries performed by Dr. W. C. Atwater. Voit in Germany, had been Atwater's professor, consequently the experiments performed in the United States were an extension of the European accomplishments in research.

The analysis of the fuel value of the principal foods appearing in the diets of people in the United States was accomplished by classifying the foods into groups. The per cent of protein, fat and carbohydrate contributed by each food group was calculated, and the energy value determined. The specific fuel values were established for each food group by determining the heats of combustion, the coefficient of digestibility of each food, and making allowances for the energy value of urinary nitrogen. The fuel values determined by Atwater for protein, carbohydrate and fat are still widely used in present day food composition tables.

The first few decades of the 20th Century marked the beginning of the development of various methods for the collection of dietary data. The total food intake of members of a family or group were estimated by weighing all foods consumed during a specified period of time. Dietary information on an individual basis was calculated by dividing the total amount of food ingested by the number of subjects comprising the sample, with suitable weighting for the composition of the family. The information furnished by the early diet surveys was not of a highly specific nature, such as has been obtained through the controlled balance studies of later years. The initial diet surveys were of value, however, in providing a better understanding of the food habits of various groups in different geographical areas.

Dunluce and Greenwood in 1918 (2) surveyed diets in hostels for munition workers and determined an over-all consumption per man per day of the workers in one hostel as being 3951 Calories daily. Details of twenty-three foods consumed in this one hostel, in quantities per man value weekly, were included in their study, the total energy value of these being 3575 Calories per man per day. The authors explained the discrepancy between the over-all mean value and that of the detailed entries by the inclusion in

the latter of nutritive constituents of a large number of smaller items (eggs, dried fruit, poultry, etc.) which were not consumed in sufficiently large quantities per head for their detailed tabulation to be useful!

Data have been collected and analyzed on a nation wide scale in the United States and abroad, which throw light on the extent to which various groups of the population share in the national food supplies, and the degree of adequacy in terms of the probable nutrient requirements, of the customary diets ingested by the various peoples of a country. The numerous family dietary studies that have been conducted in the United States since the early 1920's, as well as the United States Department of Agriculture's statistical analyses of the average quantities of various groups of foods disappearing in consumption channels, have shown that there has been a tremendous rise in the sugar and citrus fruit intake by the citizens of the United States, as well as an upward trend in the consumption of dairy products and fruits and vegetables as a whole. Paralleling these increases, there has been a decline in the consumption of potatoes, meat, and grain products. According to dietary studies made during the period 1885 to 1937, the decline in the consumption of grain products by village and city families, has been greater among those with comparatively low food expenditures. Among

families spending less than average amounts for food (\$1.87 - \$2.00 per person per week, 1935 retail food prices) meat consumption fell to a low level in 1915 - 1924, and since that period has increased relatively little. In contrast, in families spending more than average amounts for food, meat consumption declined relatively more in the decade 1915 - 1924, but since that period has increased considerably. The rate of increase in the consumption of milk and leafy green vegetables during the last fifty years, has been of about the same order of magnitude among all expenditure groups, whereas the relative increase in the consumption of vitamin C rich foods has been more striking at lower than at higher budgetary levels.

In 1933 in New York City a nutrition survey revealed that 48 per cent of the low income families included in the representative sample, had an average daily caloric intake below that estimated to be the minimum allowance. (4) In the same year a survey of low-income families in Baltimore, Cleveland, Detroit, Pittsburgh and Syracuse showed that 27 per cent of them had an average daily caloric intake lower than the minimum standard, 18 per cent had diets with a caloric value approximately 20 per cent or more below that standard. (5)

Among families of employed wage-earners and clerical workers in forty-three industrial centers in eight major geographical regions, it was found during 1935 - 1936 that the maximum proportion of white families with good diets in any region was only 21 per cent. In the region with the poorest showing, no more than 11 per cent of the families had good diets, classified according to the National Research Council Recommended Allowances. (6)

The Food and Nutrition Board of the National Research Council has promulgated the recommended dietary allowances of essential nutrients in the daily diet, with the object of having the standards applied as representing not merely the minimal requirements of average individuals, but as levels enough higher to substantially cover all individual variations in the requirements of normal people. The recommended dietary allowances are thus to be understood as desirable goals or objectives. The standards that have been recommended are generally higher than average requirements but generally lower than the doses used to meet needs created by pathological states or in certain environmental conditions, or in compensating for an earlier period of depletion. A diet shown to be below the recommended allowance would thus not necessarily indicate a condition of deficient nutrition, but a diet which meets the allowances can be assumed to provide adequate nutriture.

Dietary investigations conducted in sixty-six counties in five different geographic regions during 1936-1937 showed that only 35 per cent of white farm operator's families in the North and West, and 27 per cent in the South had diets meeting recommended allowances. Thirty-four per cent of the families in the North and West, and 30 per cent in the Southeast had diets rated as fair. The diets rated as fair in this study were those containing less than 50 per cent Calories above the estimated minimum requirement. Among the negro families in the Southeast, 24 per cent had diets rated as fair and 63 per cent had diets rated as poor. (7)

According to the allowances of the essential nutrients to be contained in the daily diet as determined by the National Research Council, less than one-fifth of the families in the United States had food supplies in 1936 that met the Council's recommendations. About one-fourth of the farm families were in this category, but only about one-seventh of the non-farm families. At least 60 per cent of the village and city families fell short of the Council's allowances with respect to calcium, vitamin B₁, ascorbic acid, and/or riboflavin, and 30 per cent with respect to vitamin A. (7)

A comparison of the American, British, and Canadian dietary allowances shows that though differences exist between the three tables, the basic figures seem to be

fundamentally similar. Most of the differences are considered to derive from different uses for which each standard is intended. The chief differences come from "a difference in the philosophy underlying the nature and purposes of Feeding Standards". (8)

The American Recommended Dietary Allowances are "levels of nutrient intakes which the Food and Nutrition Board recommends as normally desirable goals or objectives". (9) "They are intended to represent not merely the literal (minimal) requirements of average individuals, but levels enough higher to substantially cover all individual variations in the requirements of normal people". In most categories (calories are an exception), the "margin of safety" for the average person is estimated to be from thirty to one hundred per cent.

The British Medical Association figures "are believed to be sufficient to establish and maintain a good nutritional state in representative individuals of the groups concerned". They "concern the needs of healthy individuals", not the sick or convalescent. (10)

The Canadian dietary standard "is recommended as a basis for planning food supplies for individuals or groups, except where clinical observations or tests have established particular or special food requirements". (11) They "can

also be used to assess the amount of each nutrient provided by a diet for an individual or for a group of people". Finally, they "indicate a nutritional floor below which maintenance of health in people cannot be assumed". "The Standards presented have been especially based on the concepts of size, and for certain nutrients, of maintenance plus work". (11)

Thus British Standards are based on average requirement; the American on an average requirement plus a margin of safety to describe the highest need of anyone in an age or sex category; and the Canadian on the use of variations in body size in order to extract the probable cause of the individual variations in needs. The Canadian Standard is believed to represent a closer approach to the needs of the individual, in contrast to those of a population group, than is true of the other two standards. Table 1 illustrates the three dietary standards.

In a food consumption study of twenty-nine families with an income between \$500. and \$1,500. in Edmonton, Alberta in 1939, Sandin et al. (12) found that the average intake of calories, protein, fat, and phosphorus was in excess of the requirements as defined by the Canadian Council on Nutrition. However, though the mean consumption of these nutrients for the group was more than adequate,

Table 1

COMPARISON OF UNITED STATES, BRITISH, AND CANADIAN
DIETARY STANDARDS FOR CALORIES AND CERTAIN NUTRIENTS
FOR A SEDENTARY MAN WEIGHING 154 LBS. (8)

Nutrients	U. S. Recommended Allowances, Including "Margin of Safety"	British Dietary Standards	Canadian Dietary Standards, to be Adjusted for Body Weight
Calories	2400	2250	2476
Protein (gm.)	70	66	67
Calcium (gm.)	1.0	0.8	0.7
Iron (mg.)	12	12	6
Vitamin A (I.U.)	5000	5000	5000 (as carotene)
Thiamine (mg.)	1.2	0.9	0.75
Riboflavin (mg.)	1.8	1.4	1.2
Niacin (mg.)	12	9	7.5
Ascorbic Acid (mg.)	75	20	30

Footnote: The standards are stated on a per day basis.

great variation in intake was found even in the small sample under observation. Some families appeared to be very deficient in calcium and iron. Twelve of the twenty-nine families studied were recorded as ingesting adequate amounts of all nutrients. The families living on the lowest incomes were shown to be deficient in protein, calcium and iron. The mean intakes in families with no children were above standards; those with one child had a low iron intake; where there were two children in the family group, there was a deficiency in calcium and iron. The larger the family, the more deficient the diet.

Pett and Hunter conducted a dietary survey in Edmonton, Alberta in 1941. (13) The authors employed the individual consumption method in their study of seventy-six families (323 individuals). The sample was comprised of 88 per cent British stock, 9 per cent French, and 3 per cent Scandinavian and Chinese. A weighed inventory was taken of all foods on hand at the beginning of the week of study, records were kept of all food consumed at each meal by each individual during the week, and then a final inventory was made at the end of the week. A comparison was made of the number of families in the low income group (\$500. per annum) who were deficient as compared to those in the higher income group (\$1,500.).

Table 2

INFLUENCE OF INCOME ON DIETARY ADEQUACY
PER CENT OF FAMILIES DEFICIENT

	Calories	Protein	Fat	Calcium	Iron
Low Income	60	64	57	70	71
Higher Income	48	48	30	50	60

Studies have been made on college students to determine their nutritional needs. Hetler (14) determined the urinary nitrogen, basal metabolism, and protein and caloric intake of eighty-five women students at the University of Illinois, ranging in age from nineteen to thirty-seven years. Records of food intake were kept by the students eating their customary diets at dormitories, restaurants and at home. The individuals in the group ingested daily quantities of protein which ranged from 0.5 to 1.5 grams per kilogram of body weight, and showed an average basal metabolic rate of 1260 Calories per twenty-four hours which was below the standard. (Harris-Benedict Standards based on Age and Stature for Women). A definite relationship between low protein intake and low basal metabolic rates was not established.

In 1942, McKay et al. (15), studied the calcium, phosphorus and nitrogen intakes and retentions or losses

of a large group of young college women. The women carried on their customary activities and consumed their usual diets. During two consecutive school years, a study was made of the calcium, phosphorus and nitrogen intakes and retentions of nine young women when they were on basal diets supplemented during each of three periods by one, two and three cups of milk, respectively. The calcium in the diet varied with the amounts of milk used. The mean daily intake of calcium was shown to be 0.9 grams for a group of 124 who were eating according to their customary dietary habits, with large individual variations. Mean daily retentions were significantly dependent on intake. Lower intakes of calcium were more efficiently utilized when the diet adequately provided other dietary factors than when customary food intakes were consumed.

The nitrogen intakes of the women college students observed by McKay et al., varied only slightly from the daily allowance of 60 grams of protein, with the retentions being significantly related to intake. No evidence was shown of better nitrogen utilization with a controlled diet than when the subjects were consuming their customary food intake. That milk increased calcium retention due to the improvement of the diet in factors other than calcium is a conclusion suggested by the authors. The desirability

of a generous allowance of calcium for young women is believed by the authors to be indicated by the findings of the study.

Calcium and phosphorus retentions were studied when cod liver oil and yeast were added to the usual, unrestricted dietaries of thirty-four women by Hunscher and others. (16) No consistent changes were noted in the retentions by the addition of the concentrated vitamin supplements.

Nutrition surveys, wherein medical evaluation and biochemical determinations of nutrient levels in the body fluids are analyzed, have developed during the last two decades. A more complete appraisal of the state of nutrition of the individual or groups of people can be accomplished by approaching the over-all evaluation from several viewpoints. The medical examination furnishes information concerning the clinical condition of the individual, but tends to be a subjective analysis which does not measure minor degrees of under-nutrition. Biochemical methods for measuring nutritional status are as yet too limited in number to provide a complete evaluation of all the essential nutrients in the diet. The techniques of recording dietary information that have been formulated through the years in the organization, collection of data, and interpretation of the findings of the survey have contributed greatly

to the reliability in the interpretation of the results of surveys. The modern trend of employing a variety of skills or "tools" in the dietary evaluation of individuals still depends to a large extent on the diet survey as a means of assessing nutritional status.

A medical survey of nutrition in Newfoundland correlated the food intakes observed in eight hundred and sixty-eight subjects in St. John's and several other outports with clinical and biochemical evidence of abnormality relating to nutrition. The diets consumed by the peoples of Newfoundland were found to be adequate in calories and protein, but deficient in calcium, ascorbic acid, vitamin A and riboflavin. In keeping with the very poor average diet, a very large proportion of the population was found with dry skin, staring, lusterless eyes, edema of the tongue, swollen gums, or other abnormalities of the skin and mucous membranes which have come to be regarded as signs of malnutrition. A high infant mortality rate is prevalent amongst the inhabitants of Newfoundland as well as an elevated death rate from upper respiratory infections. (17)

In a nutrition survey of Norris Point, Newfoundland, in 1944, Goldsmith et al. (18) studied one hundred and twenty-six subjects who were all under physiologic stress due to growth or pregnancy. The initial survey was conducted in 1944 prior to the

compulsory flour enrichment and fortification of margarine program. A second survey was organized four years later upon the same fishing and logging village to determine the effects of the enrichment program. The 1944 initial survey showed a deficiency of vitamins A and riboflavin, and iron to be prevalent among the population. In 1948, following the administration of a school lunch program wherein the children were given cocoa and cod liver oil; pregnant and lactating women and infants received concentrated orange juice; and 0.5 per cent bone meal with 31 per cent calcium was added to all flour, the caloric content of the diet as well as the total protein, thiamine, iron and niacin all appeared to be adequate. The physical findings which correlated with the increased dietary intake, were a decrease in glossitis and neurological signs, increased height in children, elevated plasma protein readings, as well as higher hemoglobin in the blood, no avitaminosis A, and a lack of improvement in ascorbic acid and riboflavin nutriture.

Diet surveys conducted in the United States during 1940 - 1941 have shown that over-all per capita consumption of many foods was higher in 1940 than in 1936, as a result of the combined influence of educational programs, increased power of consumers to buy, food distribution, and more

abundant food supplies. Gains were greatest in fruits and vegetables and the utilization of fresh citrus fruits was more than one-third higher. Other fruits and fresh vegetables have risen 10 to 15 per cent in consumption. The intake of meat and eggs was 8 to 10 per cent higher, but dairy products less than 5 per cent higher. There was a slight decrease in the quantities of grain products and potatoes consumed. These shifts probably have meant considerable increases in the ascorbic acid content of American diets and some increase in the consumption of protein, thiamine and riboflavin. (3)

A nation-wide canvass in February 1943, in which one-day diet records were obtained from selective sampling of the population in each of forty-eight states, showed that the per cents of persons as listed in Table 3 were found not to eat these protective foods.

The peak years in average intake of food were 1945 - 1946. Intakes of calcium have increased as is true of riboflavin, which reflects the fact that milk, which is an excellent source of both these nutrients, has contributed from two-thirds to three-fourths of the calcium and nearly half the riboflavin in the national diet. Higher intakes of vitamin A as well as ascorbic acid can be associated with the increased consumption

Table 3

PER CENT OF PERSONS IN THE UNITED STATES,
DISTRIBUTED ACCORDING TO GEOGRAPHICAL SECTIONS,
WHO WERE FOUND NOT TO EAT CERTAIN PROTECTIVE FOODS. (3)

Essential Foods	New England and Middle Atlantic	East Central	West Central	South	Far West
Citrus fruits, tomatoes and greens	46	41	43	53	41
Dairy products	43	31	31	31	28
Leafy and yellow vegetables	28	26	25	21	24
Other vegetables and fruits	8	8	5	12	7
Meat, fish and poultry	9	12	12	14	14
Whole grain or enriched products	3	4	2	3	3

of vegetables and fruits. The greatest increases in nutrient intakes in recent years, as shown by diet survey studies, have been in thiamine, niacin, riboflavin and iron. About one half of these increases are the result of the enrichment of bread and flour. (19)

Man's life span, initiative, and productivity are all intimately related to his food intake and dietary habits, and in consequence, the more that is known about the food intake of peoples from all the walks of life, the more that can be added to the fund of knowledge which is necessary for the betterment of mankind. The following study is a contribution towards the appraisal of the daily diet habits of a representative sample of young married college students.

REVIEW OF METHODS

The techniques to be used in studies of what families and individuals eat may be determined by the primary purpose to be served in the resulting information, whether nutritional, sociological, psychological or economic. Rarely is a study useful for only one purpose, but the main objective of the study will affect the methods selected and the use to which the final results can be applied. Outlined here are some of the methods commonly used for studying the food consumption of populations.

Studies of the diets of individuals differ from family studies with respect to methods used and objectives. The methods employed in estimating the consumption of individuals range from a qualitative diet history or food habit inquiry to quantitative laboratory measures of the quantity and composition of the food eaten. The procedures for collecting food intake information may be enumerated as follows:

The dietary history aims to discover the usual food pattern over a relatively long period as contrasted to a list of the quantities of different foods eaten during a defined span of time. This procedure is useful in revealing major individual deviations from the traditional concepts

of good food habits, and furnishes a basis for classifying individuals into certain broad groups such as those falling above or below determined standards in one or more nutrients.

Some investigators believe that diet histories can be obtained with sufficient accuracy and completeness to justify calculation into terms of nutrients and appraisal of the individual's dietary practices. The evaluation of the dietary history must be done keeping in mind that an adequate diet can be obtained from a variety of food combinations. A set pattern of food consumption need not be adjudged as the basis for evaluation of adequacy. The daily food intake composed entirely of meat, milk and fruit for example, can provide a fully adequate diet.

The individual diet record may be obtained by estimating or measuring the food actually eaten by the individual, using common measures, or the subjects may be taught to use balances or scales. The subjects are shown how to keep the individual record for a period of seven days or more. A full description of the food, and a recipe of all mixed dishes is obtained. Compound cooked dishes greatly complicate the individual survey. These are dealt with in one of three ways:

1. A recipe is procured with the dietary record and a weight for the cooked dish is assumed, or an experimental dish is cooked and the result is taken to represent the dish of which part was actually eaten.

2. The analyses in food composition tables are used.
3. The ingredients of the dish are recorded, the weight of the cooked dish is determined, and the weights of the individual portions are referred to the original ingredients.

The third method has been shown to be the most reliable.

Another method for collecting individual data, is that in which the subject is asked to recall what he ate during a previous period, usually the last twenty-four or forty-eight hours. The subject may be asked for an estimate of the quantity of each food in terms of food models and standard measurements supplied by the investigator. The information from this type of study is of most value as a basis for determining the need for educational programs. Average values of nutrients consumed during the defined period may be computed from standard food composition tables and compared to the recommended dietary allowances for an evaluation of adequacy.

There are inherent errors in the collection of information concerning the dietary practices of the individual by the methods whereby the subject is asked to keep his individual record for a period of seven days or more, as well as that in which he is asked to recall what he ate during a previous period. The subject may

keep an incorrect record; the analyst may err in translating the subject's quantitative measures or estimates into units employed in the food table used; the food tables may not be applicable in a given case. However, various studies have shown that the carefully taken individual food record is of value in nutrition surveys. (20) Studies of this type permit reasonably good characterization of the dietary habits of groups.

A modification of the individual record method is that in which a duplicate sample of each serving of food which is consumed by the subject, is taken for analysis. This method is of value even though two portions of the same food, equal by weight, may vary in chemical composition, as the variation inherent in food samples is of lesser magnitude than that existing in the analysis of nutrient intake by computation from standard food composition tables. A factor which must be considered in applying this method is the possibility of non-inclusion in the duplicate of small items taken with or between meals. A further consideration is the effect the weighing of all food consumed has on the subject. The factor of having to weigh all food eaten during the day, usually causes the individual to cut out between meal snacks, thus altering the usual intake.

The application of the above mentioned methods may be extended to include the metabolic studies executed under controlled laboratory conditions by research groups with special facilities for the collection and analysis of data.

Accurate information collected in diet surveys depends to a considerable degree upon the personal relations established between the investigator and the subject. Skill in interviewing is an essential quality in the person conducting the investigation, as many seemingly unrelated facts can be elicited through general conversation which will increase the accuracy of the data being recorded. The establishment of good personal relations between the persons being questioned and that of the investigator is thus a factor of considerable importance in all types of dietary surveys.

Three general methods commonly employed in the study of diets of families or other groups of individuals may be designated as follows:

A perpetual inventory of food purchased and produced for household use is recorded in the family food accounts method. Day by day records of food purchases and food expenditures furnish valuable facts about family food consumption, especially among urban groups who keep only small stores of food on hand. This method is readily

understood by the homemaker, requires low cost in the collection of data and, in households where food purchasing is pretty much hand to mouth, it is not necessary to keep food accounts over a very extended period. The limiting factors may be a lack of interest on the part of the homemaker resulting in an incomplete record and difficulty in getting a random sample, as the participants must be co-operative and able.

A record by weight of food on hand at the beginning and end of a specific period of time is the procedure followed in the food inventory method. A daily entry of all food brought into the home during the designated period under study is recorded by weight. A trained investigator takes the initial and closing inventory so as to minimize the possibility of error. A calibrated scale is left at the home with careful instructions concerning the daily recording by weight of food purchased. A record of menus is obtained for the same period of study to serve as a check on the inventory records. Daily visits are made by the investigator to supervise the daily record.

The food inventory method provides one of the most accurate measures of food consumption for individual families as well as averages for groups of families. The limitations of the method are that it does not distinguish between food

intakes of family members; there is no record of plate and kitchen waste; the frequent visits of the investigator may influence the customary food pattern of the family; and the burden it places on the household that is collaborating may be considerable. A relatively high proportion of families drawn in the sample may fail to cooperate. Another limitation of this method is the high cost involved in the collection of field data and in the tabulations that follow the field work, when a survey of extensive magnitude is being conducted.

In the food list method or recall, a report is obtained from the homemaker of the estimated quantity by weight, household measure or retail unit of the various foods consumed during the previous seven days. The interviewer uses a schedule covering a complete list of foods. The food list method has been proved to give a fairly accurate measure of food bought or procured by individual families, though understatements tend to be high. For an individual family, the over-estimates of some food may partially offset the under-estimates of others, so that in terms of various nutrients, errors may be less than for individual foods. The advantages of this method are that only a single and relatively short visit by the investigator is required and a greater degree of cooperation by the homemaker can be expected. The cost of the method is low.

The original data collected in diet surveys, may be translated into nutrient terms by various methods, one of which is the computation of food values from food composition tables. The daily dietary may be estimated by the calculation of each individual item figuring on the food record, or the short method of dietary analysis may be adopted. Several food composition tables have been devised in different areas in the United States which permit the calculation of dietaries on the basis of the customary pattern of food consumption in the region. Foods are grouped according to the extent to which they figure in the dietary, and are weighted in accordance with the findings from food consumption studies of the area.

The Food Composition Table for Short Method of Dietary Analysis of Leichsenring and Donelson Wilson (21), was developed for the computation of food consumption data collected in the Northeastern section of the United States. The values in the food table were computed chiefly from the figures compiled by Watt and Merrill in Agriculture Handbook No. 8, Composition of Foods - Raw, Processed, Prepared, (22) supplemented by some values from the tables of Bowes and Church. (23). Values for cooked foods were used except for those foods customarily eaten raw. The means for the food groups were derived from the values for commonly used

foods, and weighted in accordance with the findings from food consumption studies in the United States for the years 1946 - 1948, inclusive. (24) In most instances the values were computed for the size of portions commonly used, as suggested by Bowes and Church. Foods are listed as separate items when they deviated sufficiently in composition from the means of any group to alter significantly the value obtained for any one nutrient. Certain foods which are highly seasonal in use, or which occur infrequently in American diets were not included in the table. (21)

The accuracy of the values analyzed by means of the short method were tested on two series of dietary records. These were computed first by the usual method whereby each food item is calculated separately and then by the short method. Comparison of the results obtained by the two methods showed a high degree of accuracy for the values in the food composition table. The observed differences were shown by statistical tests to be due to error in random sampling and not to real differences between the two methods. (21)

The diet survey conducted on the twenty student couples attending Michigan State College, was organized employing the food inventory method in the collection of dietary data, and was analyzed for nutrient content by the

Food Composition Table for Short Method of Dietary Analysis of Leichsenring and Donelson Wilson. The Short Method was used on account of the similarity of food consumption patterns of the peoples in Michigan and those of the other states included in the Northeast region.

PROCEDURE

The study of the food intake of twenty married couples was initiated by securing a list of the couples living in the married student housing areas from the Housing Office of Michigan State College. The unit numbers of the apartments of the married students without children were placed in two boxes. A total of fifteen numbers from each box were selected at random. Fifteen couples living in the Barracks section and fifteen in the Trailer Village comprised the initial sample. Because six of the couples from the Barracks refused to participate, a sixteenth family was chosen.

The interviewer selected at random two couples from each area to be studied each week. No particular order of sequence was established. Six couples in the Barracks section and four in Trailer Village refused to cooperate in the survey, stating that the lack of time did not allow them to do so. Since a total of twenty couples were established as a desirable sample, one couple from the Trailer Village was not used. Ten couples from each living area comprised the final sample.

The collection of data was commenced during the three week period following the closing of the nine week summer session, and prior to the beginning of Fall Term. As the

survey extended throughout the last weeks of the summer, and into the beginning of the hunting season in the fall, several of the couples made week-end canoeing and hunting trips which increased the total amount of physical activity exerted during the period they were serving as subjects.

The couples living in the Barracks quarters were contacted on two separate evenings at the beginning of each week, and two couples in Trailer Village were interviewed on two consecutive evenings at the end of each week, for a period of six consecutive weeks. The subjects were given an explanation of the project and their cooperation was solicited. The couples were not contacted prior to the evening on which the study was to be initiated, to avoid any possible change in the normal pattern of food habits.

A questionnaire was completed on the initial visit which comprised information concerning the economic status of the couple. A twenty-four hour recall diet and a brief dietary history were obtained at this time, to determine the characteristic dietary habits of each couple, as well as the distribution of food between the husband and wife.

An inventory by weight of all food on hand was made of all fresh foods, left-overs, meat and produce, and a record was kept of the measured contents of all canned

goods as stated on the container. Fresh groceries were weighed as edible portions.

A daily record sheet was left with each couple which was to be used to record all food items brought into the home during the seven consecutive days that were being studied. The importance of keeping an accurate account by weight of all items introduced into the home was explained, and a spring scale was left at the home of each subject. Prices of all food recorded on the daily record sheet were obtained simultaneously.

A form was given to each couple for checking all the meals eaten in the home, and for recording in terms of servings per person, all food consumed other than from the home food supply.

One or two visits were made by the interviewer on each couple throughout the week of study. Answers were given to questions concerning the daily record sheet, and a check was made to ascertain whether all items were being descriptively recorded.

The closing and final inventory was made by weight, seven days following the initial interview and the recording of the first inventory. The daily record sheet was collected, and all food items that had been included in the week's menus were checked, and all left-overs were weighed.

The total food consumption for each couple was determined by subtracting the items recorded on the final inventory from that of the initial inventory. The purchases included on the daily record sheet that had been utilized during the week were added to the inventory data. The food eaten away from the home was totaled and contributed towards the final over-all estimate of intake. While the nutritive value of food from gardens, and eaten away from home was included, no attempt was made to estimate the cost of this food.

The total consumption of calories, protein, calcium, vitamin A and ascorbic acid were calculated on a weekly basis employing the Food Composition Table for Short Method of Dietary Analysis of Leichsenring and Donelson Wilson. (21) Food items that were not included in the table, were determined by computation from the values reported in the United States Department of Agriculture Handbook No. 8. (22) The consumption of each nutrient per day was assessed by dividing the total intake for the week equally by seven days. The computed value of each nutrient on a per day basis was then divided equally between husband and wife for each couple.

The economic data collected at the time the questionnaire was completed, were compiled into tables to aid in interpretation of the dietary information.

RESULTS AND DISCUSSION

The weighed inventory method requires a proportionate amount of time expended by the subjects in a diet survey, but the degree of cooperation is relatively high in a college student sample. College students in general, have an intellectual interest in all types of research; are quick to understand the purpose of the investigation and are guided by a willingness to help a fellow student. The percentage of acceptance was quite high in the couples who were asked to participate in the study. Thirty couples were contacted, twenty of whom collaborated in the diet survey.

The recording of the initial and final inventories required on an average of two hours per couple. The greater proportion of the homemakers in the sample were working wives and thus were not home during the day, making it necessary to conduct the recording of the data during the evening hours. The subjects were asked to maintain a continuous record of all food purchases during the seven day period comprising the dietary study, as well as checking all meals eaten in the home. The food consumed at the home of parents, or other than from the home food supply was recorded in terms of average number of servings.

Table 4 shows the characteristics of age, height, weight, and calories consumed per day in the twenty couples

Table 4

COMPARISON OF AGE, HEIGHT, WEIGHT, EXISTENCE OF PREGNANCY
AND CALORIES INGESTED BY TWENTY COUPLES

Family Number	Calories Per Person Per Day	Age Years		Height Inches		Weight Lbs.		Wife Pregnant
		M	F	M	F	M	F	
5	2,146	25	25	70	64½	156	98	No
18	2,356	21	20	71	64	165	124	8 months
12	2,636	22	19	66	62	140	115	No
2	2,678	25	20	69	61	170	140	No
19	2,735	20	21	68	66	137	118	No
15	2,757	21	22	71	62	153	98	No
16	2,761	24	24	67½	63	165	120	3 months
4	2,811	24	23	72	70	165	142	7 months
20	2,812	22	21	72½	65	215	140	No
7	2,950	30	29	72	67½	190	140	No
11	2,989	22	21	66	61	140	102	No
10	3,031	29	26	67	61	160	108	No
1	3,067	24	22	73	69	203	130	8 months
13	3,069	23	21	70	65	170	130	No
9	3,245	23	21	68	62	150	108	No
8	3,310	37	31	66½	65	160	160	No
17	3,408	20	20	70	62	210	115	8 months
14	3,615	26	25	67	63	138	119	No
6	3,693	27	23	76	69	185	150	No
3	3,805	27	30	69½	62	180	125	No

comprising the randomized sample for the dietary survey, as well as the incidence of pregnancy amongst the wives of the group. The mean age in years of the twenty males was 24.6, with a range of 20 to 37 years. The mean age for the women was 23 years, with a range of 19 to 31. The average weight for the men was 167 lbs and that of the women was 124 lbs. The height in inches for the men ranged from 66 to 76. The height for the women was from 61 to 70 inches. The mean calorie intake per person per day was 2,990 with a range from 2,146 to 3,805 calories. No obesity was apparent in the group. Two of the women were of stocky build and might be considered somewhat, though not excessively, overweight. Five of the twenty women in the sample were pregnant, one-fourth of the sample. Three of the five pregnancy cases were in the third trimester of their term, but were not consuming the higher caloric intakes.

Table 5 records the intake of calories, protein, calcium, vitamin A and ascorbic acid of the twenty couples. Both members of each couple were receiving a fully adequate number of calories per day, as can be seen by comparing the computed values determined by an analysis of the food intake for one week to that of the National Research Council Recommended Allowances.

Table 5

INTAKE OF CALORIES, PROTEIN, CALCIUM,
VITAMIN A AND VITAMIN C OF TWENTY COUPLES

Couple Number	Calories Per Day	Protein Grams	Calcium Grams	Vitamin A International Units	Vitamin C Milli- grams
5	2,146	81.5	.64	1,988	58.1
18	2,356	93.1	.91	8,210	118.3
12	2,636	85.6	1.06	4,365	89.0
2	2,678	97.9	.96	18,790	31.7
19	2,735	93.0	.97	5,594	46.8
15	2,757	95.8	1.16	3,539	74.5
16	2,761	100.9	1.31	16,746	170.7
4	2,811	110.7	1.80	14,905	63.6
20	2,812	96.7	1.04	6,291	84.0
7	2,950	122.0	1.17	11,361	99.9
11	2,989	106.2	.48	26,250	68.1
10	3,031	106.8	1.05	11,691	98.9
1	3,067	127.8	1.38	4,619	21.8
13	3,069	78.7	1.37	7,266	79.0
9	3,245	101.6	.62	28,200	79.4
8	3,310	122.5	.73	12,143	140.6
17	3,408	111.1	1.71	7,110	74.5
14	3,615	114.1	1.06	8,272	84.4
6	3,693	112.9	1.45	16,626	117.0
3	3,805	130.5	2.20	16,183	192.0

The mean calorie consumption per person per day was obtained by weighing all food as edible portions, and allowing for the waste factors of bone in meat, vegetable refuse and loss of vitamin content during cooking and processing. No correction was made for plate waste. The mean caloric intake per person per day would be 2,691 calories if the 10 per cent plate waste factor of the British per capita calorie estimate is assumed. All nutrient estimates were calculated on the basis of an equal distribution of food items between the two members in the household. This was based on the information provided by the diet history recorded by each couple at the time of the initial interview.

The Food and Nutrition Board of the National Research Council has suggested that an intake of 2,400 calories per day can be applied as a standard for the average, sedentary, seventy kilogram man, and 2,000 calories per day for the average fifty-six kilogram sedentary woman. The Recommended Daily Dietary Allowances represent group averages however, and the proper calorie allowance is considered to be that which will maintain body weight at the degree most conducive to well-being of the individual over an extended period. The absence of any manifest obesity may be taken as an indication that the subjects included in the study were not consuming an excessive number of calories.

The average protein intake of each individual studied exceeded the National Research Council Allowance of 70 grams per day required by a seventy kilogram average man, and the 60 grams per day which is recommended for the average sixty kilogram woman. The protein allowances recommended for normal adults are based on the standard of one gram of protein per day for each kilogram of body weight. This allowance carries generous provision for differences in the proteins of normal diets, as well as for individual variations of protein requirement among normal people. The total protein intakes of the subjects studied in the diet survey, consisted of both animal and vegetable protein and ranged from 85 to 156 grams per person per day. This range of intakes easily covers the needs of the five women known to be pregnant, all of whom were consuming more than 100 grams of protein per day, even if a 10 per cent plate waste were assumed and deducted from the protein intakes reported.

A comparison of the total daily calcium intake of the twenty couples with the Recommended Allowances suggested that seven couples consumed less than the allowance for calcium. The recommended allowance for calcium is stated as being one gram per day for adults of average needs, which is believed to cover the needs of all but one in one hundred of the so-called "normal" adult population.

The allowance includes a margin of safety for those individuals requiring a greater intake due to stress, poor nutritional history, faulty absorption or for other physiologic reasons. However, according to the most recent information, an allowance of 0.50 grams per person per day is believed to be sufficient to cover average needs. (25) The couple that was consuming 0.48 grams per person per day of calcium may therefore be assumed to be meeting the minimum standards, although no margin of safety may have been available on this intake. The seven couples consuming 0.96; 0.64; 0.73; 0.98; 0.62; 0.91; and 0.97 grams per person per day, respectively may be assumed to be covered with varying margins of safety. The wife in the couple with the intake of 0.91 grams per day was in her last trimester of pregnancy, and may therefore have been meeting only her minimum needs. The remaining thirteen couples were all consuming generous amounts of calcium.

Three-fourths of the subjects in the study were consuming more than the National Research Council Allowance for vitamin A. The intakes ranged between 1,988 and 26,250 International Units per person per day. Studies on the allowance of vitamin A for adults have indicated that the average requirement is 25 to 55 units for each kilogram, or 2,000 to 4,000 units of vitamin A per se daily for the

adult, and twice these amounts or more if the sole source is carotene from foods. One couple can be considered to be ingesting a minimum amount with an intake of 1,996 International Units per person per day, only 800 of which was provided as pre-formed vitamin A. Three of the twenty couples were consuming 3,539; 4,365; and 4,674 International Units per person per day, respectively, which would be in the lower range of adequacy. However, approximately one-third of this was consumed as vitamin A and thus would probably meet the needs of the body for this vitamin.

The recommended allowance for ascorbic acid is 75 milligrams for the adult man and 70 milligrams daily for the adult woman, with a standard of 100 milligrams for the latter part of pregnancy. Five of the twenty diets analyzed by computation were found to be below the National Research Council Recommended Allowance for ascorbic acid, their intakes being the following: 31.7; 63.6; 58.1; 68.1; and 46.8 milligrams per person per day. However, there is little evidence that adult maintenance requires these allowances for vitamin C. On the other hand, three of the wives who were pregnant were below the standard. One case, who was in the last trimester of pregnancy, had an average intake of only 21.8 milligrams, which may be considered lower than desirable. The values computed in

the daily food intakes of the twenty couples were calculated with allowances being made for a decreased content of ascorbic acid in canned fruit juice as well as in frozen juices. Cooking losses were also accounted for, consequently the final values probably do not over-estimate the value of the food as actually eaten.

The thiamine, riboflavin and niacin content were not calculated in the twenty food intake records as the protein intake exceeded the recommended allowance and therefore, these vitamins would most probably be present in adequate quantities. The amount of milk consumed by the subjects may be considered to have supplied the necessary riboflavin, except in the case of the couple who had the intake of 0.48 grams of calcium. This diet was examined for other sources of riboflavin and appeared to contain quantities of protein sufficient to meet the allowances for this vitamin. The niacin and thiamine intakes would be directly related to the liberal intakes of high quality protein. The calculation of other nutrients did not seem justified.

The effect of season should be considered on the economic status as well as on the dietary intake of each couple. The abundance of fresh foods on the market and from vegetable gardens, enabled the couples to increase their over-all caloric intake without a subsequent increase

in the total food budget. Fourteen of the couples had acquired a job during the summer months when they were not attending classes. If it is assumed that the average income of more than half of the subjects was probably slightly higher during the period under study than during the rest of the year, it may be believed that the caloric and protein content of the diet would be increased proportionally.

The average expenditure for food by the twenty subjects was calculated as \$1.10 per person per day. The total food cost was determined on the basis of the local food store prices, and did not include the savings effected by the possession of a vegetable garden, nor by the gifts of food given to the couples.

The average expenditure for food was based on the food purchases made during a seven day period, with allowance for food used from the inventory. As can be seen in Table 6, the majority of the couples were receiving contributions from their parents. Three couples were financed almost entirely by their respective parents, but fourteen couples received presents of groceries or ate at the home of their parents on the week-ends. Thus, the actual food cost per couple was probably above the calculated figure. The lowest caloric intake was that

Table 6

COMPARISON OF FOOD COST, AVERAGE INCOME, SOURCE OF INCOME,
STUDENT STATUS AND CALORIES INGESTED BY TWENTY COUPLES

Family Number	Calories Per Person Per Day	Average Food Cost Per Person Per Day	Average Income Per Month	Source of Income			G.I. Bill	College Status
				Parents	Wife	Husband		
5	2,146	\$.81	\$375.		FT ¹	PT ²		G ³
18	2,356	1.00	275.	x		PT		UG ⁴
12	2,636	.94	190.*		FT	PT		UG
2	2,678	.81	190.*		FT		x	UG
19	2,735	.81	325.	x		PT		UG
15	2,757	1.29	190.*		FT	PT		UG
16	2,761	.94	225.		PT	S ⁵		G
4	2,811	1.15	170.*		FT	PT		UG
20	2,812	.89	225.		FT			UG
7	2,950	1.43	375.		FT	PT	x	G
11	2,989	1.10	115.	x				UG
10	3,031	1.04	325.		FT	PT		G

Table 6 (Continued)

Family Number	Calories Per Person Per Day	Average Food Cost Per Person Per Day	Average Income Per Month	Source of Income			G.I. Bill	College Status	
				Parents	Wife	Husband		Wife	Husband
1	3,067	\$ 1.13	\$150.	x		PT			UG
13	3,069	1.16	115.*		PT	FT		UG	UG
9	3,245	1.10	190.			PT	x	UG	UG
8	3,310	1.59	170.*		PT	PT	x		UG
17	3,408	1.50	170.*	x		PT			UG
14	3,615	1.09	375.		FT	PT			G
6	3,693	1.29	425.		FT	PT			G
3	3,805	1.41	225.			S			G

1 PT stands for full time.

2 PT stands for part time.

3 G for graduate student.

4 UG for undergraduate student.

5 S stands for scholarship.

* Contribution by parents in food supply.

Note - Income of couple number 2 and couple number 13 are of doubtful reliability.

of the couple who had the lowest total food expenditure (81 cents per person per day). However, they did not have the lowest income. This couple consumed a very moderate amount of food during the week, making up for it during the week-ends at the home of their parents.

The majority of the subjects had been occupying living quarters on the campus for at least six months and thus had availed themselves of the opportunity to develop a vegetable garden. Thirteen couples depended to a large degree on the produce obtained from their gardens. The decreased cost of fresh vegetables produced in this manner influenced the total intake of vitamin A and ascorbic acid considerably. The couples who did not own a vegetable garden likewise had an elevated intake of fresh foods, as these items were reasonably priced in the grocery stores. The parents and friends of many of the couples presented them with gifts of fresh foods which contributed significantly to the total food consumption. The seasonal effect on the total food intake could thus be assumed to be considerable.

Table 6 also presents the source of income of the twenty couples included in the diet survey. Three of the couples were receiving a living allowance from the government through the G.I. Bill. Three couples were being

financed by their parents, though part time summer jobs held by the husband of each of these couples contributed to their total income. Ten of the homemakers were working full time, their salary being the principal source of income for the couple. Three wives and twelve of the husbands held part time jobs. Two of the husbands were working full time on the night shift at one of the factories in down-town Lansing, and attending classes during the day. Two of the husbands were being financed by scholarships through their college career, which afforded a subsistence allowance for both the husband and wife. It is believed that the stated incomes of couples number 2 and 13 are underestimated, as these two couples appeared unwilling to furnish reliable facts concerning their economic status.

There were seven wives who had a full time job, who also carried the responsibility of all meal preparation in the home. Six of the twenty wives included in the study shared the meal preparation duties with their husbands, and six non-working wives and one husband did all the cooking. The husband who did all the cooking for the couple, was a full time student during the college year, as well as a full time factory worker during the night shift on six evenings a week. His wife had a full time job.

The mean money income per month was \$241. with a range from \$110. to \$425. per month. The daily food expenditures did not bear a very close relationship to the total monthly income, as can be seen in Table 6. The lack of correlation between the two figures may be explained on the basis of the contributions provided by the parents of each couple.

In the majority of the couples the responsibility for marketing was shared by the husband and wife. Thirteen couples customarily marketed on the week-ends, the remaining seven couples shopped several times during the week. Table 7 shows that more couples buy in the chain stores than at the more expensive independent stores located near the college campus. One couple bought daily in an independent store, and another couple shopped daily at the cooperative store located on the college campus.

The degree of education in the twenty couples included in the dietary survey was high, as can be expected in a group of college students. Thirteen of the husbands were completing their senior year in undergraduate school, and seven were candidates for a graduate degree. The seven graduate students consisted of two who were working on a master's degree and five who were studying for the degree of Doctor of Philosophy. Two of

Table 7
MARKETING AND MEAL PREPARATION PRACTICES
OF TWENTY COUPLES

Family Number	Marketing Practices		Buyer	Meal Prepared by
	Time	Place		
5	Week-end	Chain Store	Wife	Wife
18	Every day	Chain Store	Wife	Wife
12	Friday P.M.	Chain Store	Both	Both
2	Saturday	Chain Store Father's Store	Both	Husband
19	Every other day	Independent store	Both	Wife
15	Any time	Chain Store	Both	Both
16	Three P.M. 's a week	Chain Store	Both	Wife
4	Week-end	Chain Store	Both	Wife
20	Thursday P.M.	Chain Store	Both	Both
7	Saturday	Chain Store	Wife	Wife
11	Saturday	Chain Store	Wife	Wife
10	Thursday or Friday	Chain Store	Both	Both
1	Friday P.M.	Chain Store	Both	Both
13	Evenings	Chain Store Father's Store	Both	Wife
9	Thursday or Friday	Chain Store	Wife	Wife
8	Every day	Campus Co-op	Wife	Wife

Table 7 (Continued)

Family Number	Marketing Practices			Meal Prepared by
	Time	Place	Buyer	
17	Week-end	Chain Store	Both	Wife
14	Week-end	Chain Store	Both	Wife
6	Week-end	Chain Store	Both	Both
3	Every other day	Chain Store	Both	Wife

the wives were graduate students, and three were in their senior year of undergraduate school.

Table 8 shows the number of families possessing a car, radio, telephone, or television set. Nineteen of the twenty couples owned a car, one hundred per cent of the couples owned at least one radio, and in many instances, there were two or three radios in the home. Ten of the couples interviewed had a telephone, and seven owned a television set. The couples who possessed a television set were not necessarily those who had a more liberal monthly income. Five of the television sets had been given to the couples by their respective parents.

A factor which needs to be considered in the critical evaluation of the diet consumed by twenty couples living on the campus of Michigan State College, is the effect that the mechanics of recording the food consumed had on the general pattern of dietary habits. The presence of the interviewer can be considered to have had only a minor effect on the customary food habit patterns of the twenty couples, as the subjects were not contacted more than three times during the period of one week in which they were being recorded. However, the knowledge that an evaluation was to be made of the food consumed during the week, could safely be said to have influenced the

Table 8
COMMODITIES OWNED BY FAMILIES

Family Number	Car	Radio	Television	Telephone
1	Yes	Yes	Yes	Yes
2	Yes	Yes	No	No
3	No	Yes	No	No
4	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes
6	Yes	Yes	No	Yes
7	Yes	Yes	Yes	Yes
8	Yes	Yes	No	Yes
9	Yes	Yes	Yes	Yes
10	Yes	Yes	Yes	No
11	Yes	Yes	No	No
12	Yes	Yes	No	No
13	Yes	Yes	No	No
14	Yes	Yes	No	Yes
15	Yes	Yes	Yes	No
16	Yes	Yes	No	No
17	Yes	Yes	No	Yes
18	Yes	Yes	No	No
19	Yes	Yes	No	No
20	Yes	Yes	No	Yes

subjects in their buying habits. The caloric content was probably increased by the study, but an elevated intake of meat and eggs can be assumed as the most probable change that was made.

In summary, it may be stated that whereas the diet consumed by the twenty students included in the sample was generally considered quite adequate, the food intake may not be representative when considered on a yearly basis. The abundance of fresh foods from vegetable gardens, their availability on the market, and the contributions from the parents would increase the total food consumption during the summer months, but these sources of extra food may be lacking at other seasons of the year. A further consideration would be that a number of students in the study had taken temporary jobs during the late summer. They may not be able to supplement their incomes by extra jobs during the school year. A more limited budget might decrease the total food intake but in particular less meat and similar high cost protein tends to be purchased thus decreasing the protein content of the diet. It is recommended that further studies be conducted on the food intake of a representative sample of students at other seasons of the year to determine the adequacy of the diet over a more extended period of time.

Table 9

CONSUMPTION OF BEER AND CIGARETTES
BY TWENTY COUPLES

Family Number	Bottles Per Week	Packs Per Week	
		Husband	Wife
5	6	None	None
18	6	5	5
12	3	5	None
2	None	7	None
19	48	5	5
15	None	None	None
16	None	None	None
4	None	8	None
20	6	None	5
7	7	4	3
11	None	None	None
10	None	None	None
1	12-16	5	5
13	None	None	None
9	None	6	6
8	12	5	5
17	None	4	4
14	2	7	None
6	12	7	None
3	None	1½	None

SUMMARY AND CONCLUSIONS

The food intake of a randomized sample of twenty married couples was measured. Ten of the couples occupied living quarters in the area commonly referred to as "The Barracks" and ten were located in "Trailer Village" at Michigan State College.

A weighed inventory of all food on hand at the beginning and end of a seven day period was recorded. A questionnaire was completed which comprised information concerning the economic status and food history of the couple. All food purchases that were made during the week were recorded, as well as the food items that were taken outside of the home.

The total number of servings of each foodstuff consumed in seven days was converted into terms of nutrients by means of the values included in the Food Composition Table for Short Method of Dietary Analysis of Leichsenring and Donelson Wilson (21) and the Agriculture Handbook No. 8 - Composition of Foods - Raw, Processed, Prepared (22).

The findings of the diet survey may be stated as follows:

1. The average age of the male subjects was 24.6 years, with a range from 20 to 37 years. The mean age for the

women was 23 years, ranging from 19 to 31 years. The average weight for the men was 167 lbs, and that for the women 124 lbs. The height in inches for the men was between 66 and 76, with that for the women between 61 and 70 inches. Five of the twenty homemakers were pregnant.

2. The average caloric intake per person per day was 2,990 or 2,691 calories per person per day if a ten per cent plate waste factor is applied. Plate waste was not recorded.

3. The protein intake was in excess of the standard of one gram per kilogram, even with an allowance for plate waste.

4. All couples probably were receiving at least minimum amounts of calcium.

5. Vitamin A intakes ranged from 1,996 to 33,396 International Units per person per day.

6. Six of the twenty diets analyzed had less than 75 milligrams ascorbic acid per day. Three of the wives who were pregnant were below the recommended allowance of 100 milligrams per day for the latter part of pregnancy.

7. The total food cost per person per day was calculated as \$1.10, but did not take into account food which was not purchased.

8. Three couples were financed by their parents, and three were receiving government allotments. Three wives and twelve husbands worked part time, and two husbands held full scholarships. Seven of the twenty wives were working full time, and two husbands worked the night shift at a factory. Six of the couples shared the meal preparation responsibility; thirteen wives and one husband did all the cooking. The majority of the couples did the marketing cooperatively between the husband and wife.

9. Nineteen of the twenty couples owned a car, and all of the subjects had at least one radio in the home. Ten couples possessed a telephone, and seven couples owned a television set.

10. The diet consumed by the subjects appeared to be adequate, but included many inexpensive seasonal foods which would not be available at other times during the year.

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APPENDIX

Table 10

CALCULATION OF CERTAIN NUTRIENTS OF FOOD CONSUMED
IN ONE WEEK BY A REPRESENTATIVE COUPLE¹

Food	Grams	Calories	Protein Grams	Calcium Grams	Vitamin A International Units	Ascorbic Acid Milli- grams
I. Dairy Products:						
Milk	6,735	4,620	238.0	7.84	10,780	56.0
Oleomargarine	339	2,373	-	-	11,187	-
Cottage Cheese	453	427	87.7	.4	90	-
Cheddar Type						
Cheese	100	412	24.7	.7	1,386	-
Ice Cream	1,920	3,960	72.0	2.4	10,080	24.0
Eggs	1,650	2,640	214.5	.99	18,810	-
II. Meat and Fish:						
Chicken	200	390	39.0	.02	-	-
Ham and Pork	523	1,932	124.2	.06	-	-
Beef, Lamb, Veal	1,103	3,528	279.3	.14	-	-
Luncheon Meats	671	1,895	133.8	.22	-	-
III. Fruits:						
Citrus	25	11	.1	-	28	11.0
Melon	900	180	6.0	.12	30,780	300.0
Banana	600	540	6.0	.06	2,580	60.0
Peach	440	308	2.2	.04	4,004	26.4
Pear	150	82	.7	.01	142	6.0

¹ Calculated employing the "Food Composition Table for Short Method of Dietary Analysis" (2nd Revision). J. M. Leichsenring, Ph. D., and E. Donelson Wilson, Ph. D. Journal American Dietetic Association, Volume 27, p. 386, 1951.

Table 10 (Continued)

Food	Grams	Calories	Protein Grams	Calcium Grams	Vitamin A International Units	Ascorbic Acid Milli- grams
IV. Vegetables:						
Peas	300	210	12.0	.06	1,890	15.0
Carrots	355	105	1.7	.10	43,750	4.6
Mixed Vegetables	300	87	4.8	.06	9,000	4.5
Green Beans	400	100	6.0	.16	2,640	18.6
Green Peppers	300	75	3.6	.03	2,220	297.0
Onions	400	160	4.0	.12	320	32.0
(Lettuce	683					
(Cucumber	100	166	8.3	.33	1,743	66.4
(Celery	50					
Tomatoes	1,100	220	11.0	.11	11,385	198.0
Parsley	4.5	2	.14	-	328	7.6
Potatoes	910	773	18.2	.09	182	63.7
V. Legumes:						
Beans	300	300	19.5	.15	30	3.0
VI. Cereal Products:						
Refined						
Rolls, white	180	480	15.0	.06	-	-
Whole Grain and						
Enriched						
(White bread	1,792					
(Flour	105	5,056	158.0	1.2	-	-
VII. Sweets:						
Candy, Sugar, Sirup						
(Sugar	90					
(Jam	360	1,650	-	-	-	-

Table 10 (Continued)

Food	Grams	Calories	Protein Grams	Calcium Grams	Vitamin A International Units	Ascorbic Acid Milli- grams
VIII. Desserts:						
Cookies	336	1,470	21.0	.08	840	-
Pudding	416	435	13.0	.40	652	-
IX. Fats:						
Bacon	262	1,365	19.5	-	195	-
(Mayonnaise	380					
(Vegetable Short.	138					
(Ham Fat	40	2,929	41.8	-	418	-
X. Others:						
Soft Drinks	512	156	-	-	-	-
Beer	1,536	734	91.8	.06	-	-
Mushrooms-Canned	184	19	2.5	.01	-	-
Dill Pickles	735	80	5.1	.18	2,263	43.8
Bread & Butter Pickles	240	259	1.9	.03	264	16.8
Raisins	55	134	1.1	.03	25	-
TOTALS:						
Per Person Per Day		2,875	120.5	1.16	12,000	89.6

Interview Form to be filled out on First Day of
Inventory

1. Name of Family:
2. Unit Number.
3. Members in the Family: Name Age Height Weight
 Wife
 Husband
4. Is husband or wife on G.I. Bill?
5. If not, what is main source of income?
6. Does husband and/or wife have a part time job?
7. Assistantship?
 (husband
8. How long has (wife been a student on the campus?
9. How much rent do you pay, including all utilities?
10. Do you own a car?
11. Do you own your furniture?
12. Do you own a radio?
13. Telephone?
14. Television?
15. Does housewife or husband prepare the meals?
16. Who does the marketing?
17. When is it done?
18. Where is it generally done?
19. Has husband or wife taken any Home Economics courses?
20. Do you have a vegetable garden?
21. Is any member of the family taking vitamin preparations?

22. Any medicine such as iron, laxatives, etc.?
23. Is any member of the family under a doctor's care?
24. Is wife pregnant?
25. When was last pay cheque received in relation to this study?
26. When is pay day customarily?
27. Please check figure closest to your monthly income.
 1. \$100. - \$120. -
 2. \$120. - \$140. -
 3. \$140. - \$160. -
 4. \$160. - \$180. -
 5. \$180. - \$200. -
 6. \$200. - \$250. -
 7. \$250. - \$300. -
 8. \$300. - \$400. -
 9. \$400. - \$500. -
28. Does the religious affiliation of the family affect the food pattern in any way?
29. Does wife/husband smoke?
30. How many packets of cigarettes does the family buy per week?
31. How many bottles of beer do you buy per week?
32. Other liquor?

- - - - -

Recall Sheet of Food Consumed by Family in one Twenty-Four Hour Period

Name:

Day of the Week:

Date:

Unit Number:

Directions: List all the food that you ate during the day, including butter, sugar, cream, and beverages. Tell whether one member of the family did not eat all foods on menu, or if one person ate a double serving of one food. Tell whether food was raw, cooked. If ice cream is included during the day, list the kind and brand.

Foods eaten for Breakfast

Description

Eaten by both members?

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

List any in-between meal foods such as coffee, fruit, milk, cookies, etc.

- 1.
- 2.
- 3.
- 4.

Foods eaten for Lunch
Description

Eaten by both members?

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

List any in-between meal foods such as coffee, fruit, milk, cookies, etc.

- 1.
- 2.
- 3.
- 4.

Foods eaten for Dinner
Description

Eaten by both members?

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Chart No. 1

Please check meals eaten at home by each family member during the week.

	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
	B	L	D	B	L	D	B	L	D	B	L	D	B	L	D	B	L	D	B	L	D
Husband																					
Wife																					

32. If lunch was not eaten at home, was a box lunch taken from the home?
33. If any meal was eaten away from the home, where was it taken?

Daily Record Sheet

To be filled out each time a food product is brought into the house during the week that the inventory is being taken. Record the item, description such as brand, and the weight or measure.

Please include all vegetables or fruits that are home grown.

<u>Name of Product</u>	<u>Description</u>	<u>Quantity, weight or measure</u>	<u>Price</u>
Example: Bread	Whole Wheat	1 large loaf	\$.20

Initial Inventory

<u>Product</u>	<u>Weight or Measure</u>	<u>Description</u>	<u>Price</u>
1. Milk:			
Fresh			
Canned			
Powdered			
Evaporated			
2. Bread:			
Whole Wheat			
Cracked Wheat			
White			
Rye			
Raisin			
Other			
3. Eggs			
4. Butter			
Oleomargarine			
5. Meat:			
Cold cuts			
Weiners			
Hamburger			
Sausages			
Pork chops			
Stew meat			
Bologna			
Salami			
Other			
6. Flour:			
Enriched			
Nonenriched			
7. Salt:			
Regular			
Iodized			
8. Crackers:			
Soda			
Graham			
Ry-Krisp			
Cheese			

<u>Product</u>	<u>Weight or Measure</u>	<u>Description</u>	<u>Price</u>
9. Canned Soups: Kind and brand:			
10. Fresh Fruits:			
11. Canned Fruits:			
12. Dried Fruits:			
13. Frozen Fruits:			
14. Fresh Vegetables:			
15. Canned Vegetables:			
16. Frozen Vegetables:			
17. Dried Beans			
18. Dried Lentils			
19. Dried Peas			
20. Macaroni, spaghetti, noodles			

<u>Product</u>	<u>Weight or Measure</u>	<u>Description</u>	<u>Price</u>
21. Coffee:			
Instant			
Regular			
22. Cocoa			
23. Tea			
24. Beer			
25. Coca-cola			
26. Orange Pop			
Carbonated Beverages			
27. Cookies			
28. Cigarettes			
29. Candy Bars			
30. Prepared Foods in Cans:			
31. Prepared Mixes:			
32. Baked Goods:			
Bread			
Cakes			
Cookies			
Pies			
33. Home Produced Foods:			
Fresh Vegetables			

<u>Product</u>	<u>Weight or Measure</u>	<u>Description</u>	<u>Price</u>
34. Fresh Fruits			
35. Frozen Fruit Juices:			
Orange			
Lemon			
Grapefruit			
36. Others:			

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