# A STUDY OF THE FOOD CONSUMPTION OF THE INDIVIDUAL MEMBERS OF A FAMILY GROUP

by

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# INTRODUCTION

Nutrition workers are interested in determining what part appetite plays in the selection of food. Sherman (26) says, "Inasmuch as the most prominent of the nutritive requirements is the need for energy and the yielding of energy is the one function in which practically all the articles of food take part, it is logical to expect that 'amount of food' will correspond more nearly to the energy requirement than to any other one factor of food value or nutritive requirement. Observation confirms this impression."

As a result of studies of the food needs of children and adults, nutritional standards have been formulated for each of the known food requirements, except vitamins. Nutrition workers caution against attaching too much weight to these standards. Atwater (26) emphasized that a dietary standard was "only an indication and not a rule." A need is felt for more information concerning the actual food consumption of people of all ages and conditions of life.

Such information concerning food intake may be determined by a study of the diet of a group or of individuals. In a group study the amount of food eaten by a given number of people is recorded for a definite period of time and the nutritive value calculated. Such a study, in which it is

assumed that all subjects have similar requirements and consume like portions of food, serves only as an index to the food habits of the group.

In contrast to this is the more accurate individual study in which the food eaten by each subject is weighed and evaluated. The effects of age, appetite, food likes and dislikes, "in between meal eating", and special foods are indicated by the results, thus giving a more valuable record of the individual intake than that of the group study.

Early dietary studies were stimulated largely by a desire to establish nutritive standards for the family. Since it was believed that appetite guided the individual to select the amount of food best suited to his needs, records of the actual food intake of people in all walks of life were used as the basis for determining requirements. The purpose of the work of later investigators was to find to what extent the food consumed by various groups was supplying the factors believed to be necessary. At the present time, nutritionists are cautioning against giving too much importance to these standards, believing there is a need for more information concerning the actual food consumption of people of all kinds before generalizations can be accepted without limitations.

Because comparatively few such records have been made,

it seemed advisable to add to the information concerning the food consumption of a healthy family group by means of a weighed individual dietary study of its members.

## REVIEW OF WORK IN THE FIELD

Voit (26) in Germany and Atwater (26) in America, during a period of years extending from 1880 to 1906, determined by careful dietary studies the average food intake of people living under various conditions. They assumed that appetite and instinct were safe guides to the physiological needs of the body. Voit concluded from his records of food consumption that a 70 kilogram man, living in Germany and doing a moderate amount of work, had a daily energy requirement of 3050 Calories and needed 118 grams of protein. By moderate work, he meant 9 or 10 hours a day spent in such activity as that of a carpenter or mason.

Atwater adapted the Voit standards to meet the needs of American men. He suggested as the daily requirement a range of 3000 to 3400 Calories and 100 to 120 grams of protein for a 70 kilogram man. Atwater said however, "A man may live and work, and maintain bodily equilibrium on either a higher or a lower nitrogen level, or energy level," thus indicating his belief in man's ability to adjust himself to his plane of food intake.

Standards similar to these were suggested by Langworthy (26) as the result of data collected from diets of a large number of people in the United States and other countries. He concluded that the daily food requirements of a man of average size and moderate activity do "not differ very markedly from a general average of 100 grams of protein and 3000 Calories."

Chittenden (26) seriously questioned the assumption that appetite was an infallible guide to food intake. From the results of experiments with a group of volunteers who ate a diet for a period of 9 months, which contained approximately 1/3 the amount of protein suggested by Voit, he concluded that the ordinary diet supplied an excess of food, especially protein. He suggested a new standard of 60 grams of protein and 2800 Calories for a 70 kilogram man.

Sherman (26) came to the conclusion from results obtained by four methods of studying the energy requirement of men, i.e., dietary studies, respiration experiments, carbon and nitrogen metabolism experiments, and direct calorimeter experiments, that the daily energy requirement of young to middle aged men of average size living in one room is 2200 Calories. An allowance for moderate activity raises his suggested standard for a 70 kilogram man to 3000 Calories daily.

In 1929 Hawley (8) compiled a summary of the food intake of the members of 192 college organizations from dietary studies made under the direction of the Office of Home Economics of the United States Department of Agriculture and from analyses of 11 other dietary studies previously made by other investigators. This summary showed that college students consumed an average of 15 per cent more energy and 59 per cent more protein than is commonly believed to be necessary.

According to Sherman (25), the total energy needs of men are affected by the activity, age, and size of the subject, and by the kind and amount of food eaten. He also indicates that climate has an effect on energy requirement since in warm weather it is not necessary to burn any considerable amount of food merely for the production of heat. Rose (19) says, "Warm days do bring a muscular relaxation which reacts on the digestive tract as well as the rest of the body and it needs to have its task lightened somewhat if we do not wish to run the risk of an upset."

In some recent investigations Benedict (2) and Jenkins (13), working independently, have found the basal metabolism of subjects in moderate climates to be below the predicted standards. Similarly, de Almeida (1) in Brazil, Sundstroem (27) in tropical Australia, Tilt (28) in Florida, and

Hofkesbring and Borgstrom (6) in New Orleans, have found the basal metabolism of native whites living in tropical and subtropical regions to be from 10 to 20 per cent below the predicted standards. To what extent this may be due to climate is undetermined.

Dietary standards for children differ from those for adults in that they must provide not only for all energy expenditures but must also allow for growth. Information as to the energy requirement of healthy young children has come from studies of their actual food intake. Gillett (20), from her survey of 223 dietary studies of children has made estimates concerning energy requirements which she has expressed in terms of Calories per day for children of different ages.

Holt and Fales (11), using the individual method, made an investigation of the food intake of more than 100 children from 1 to 11 years of age. In this study an allowance was made for basal metabolism, activity, growth, and excreta. As a result they have prepared tables indicating the number of Calories required per kilogram of body weight per day for children of different ages.

According to Sherman (26), a reasonable protein allowance for adults is 1 gram per kilogram of body weight or about 70 grams of protein a day for an average man, which is

50 per cent above the present estimate of the actual requirement. He states, "Little can be said with confidence regarding the best amount of protein for children after the nursing period. In practice, well balanced dietaries for children usually contain 10 to 15 per cent of the total energy in the form of protein."

Holt and Fales (12) concluded from their experiments on children that a child's diet should average approximately 4 grams of protein at 1 year, diminish to 2.6 grams at 6 years, and remain at this level throughout the growth period or until about 18 years of age. McKay (16) found the protein in the diet of 55 children to average 2.7 and 2.6 grams per kilogram per day for boys and girls.

Comparatively few studies have been conducted for the purpose of determining the individual's minimum requirements for calcium, phosphorus and iron.

As the result of analyses of 97 balance experiments of from 3 to 8 days duration upon men and women, Sherman (24) determined the average amount of calcium excreted daily to be 0.45 gram. He suggests a standard allowance of 0.68 gram per man per day which allows a 50 per cent margin of safety. From similar phosphorus balance experiments on 95 adults Sherman (26) found an average of 0.88 gram of this element necessary to maintain equilibrium. He again adds a 50 per

cent margin of safety which makes a standard per man per day of 1.32 grams of phosphorus.

Sherman and Hawley (23) performed calcium and phosphorus balance experiments on 12 children from 3 to 13 years of age. The results showed that the children retained an average of 0.01 gram of calcium and 0.008 gram of phosphorus per kilogram of body weight per day. In three cases, studied to determine the effect of milk on calcium retention, the optimum storage took place when about one quart of milk was consumed daily by each child. As part of the same study an attempt was made to compare the utilization of the calcium of vegetables with that of milk. The children utilized the calcium from milk better than that from vegetables.

In contrast to this it was found by Blatherwick and Long (3) that 2 women utilized the calcium from vegetables as well as that from milk. Similar results were obtained by Rose (18) with the calcium from carrots. It would appear that adults may be better able than children to use vegetables as a source of calcium.

By means of calcium and phosphorus balance experiments with 18 undernourished children, Wang, Kern, and Kaucher (29) determined the minimum requirement to be 0.023 gram of calcium and 0.029 gram of phosphorus per kilogram of body weight per day. An intake smaller than these amounts result-

ed in a negative balance.

When Holt, Courtney, and Fales (9) fed children a diet which supplied less than 35 per cent of the total Calories in the form of fat, the children's calcium absorption was decreased. A study by Mallon, Jordan, and Johnson (15) showed that a variation in the fat content of the diet had no influence on calcium retention. However, it must be remembered that one of these experiments was performed on children and the other on adults so the findings are not necessarily contradictory.

The importance of iron in the diet is indicated by the results of a study by Potter and Kramer (17) in which the hemoglobin content of the blood of white rats was increased by the addition of iron to a diet believed to be adequate. From analyses of available iron balance experiments on adults, Sherman (25) found that a daily allowance of 10 to 12 milligrams of iron would maintain the average man in iron equilibrium. Allowing the usual margin of safety he suggests a standard of 15 milligrams of iron per day for men and women.

In an iron balance experiment conducted by Rose (22), a girl 31 months of age was maintained in a state of negative balance on a diet which supplied 0.50 milligram of iron per 100 Calories which was the amount formerly suggested by

Rose (21) as desirable. She now recommends an intake 50 per cent higher for a child 2 to 3 years of age which would be 0.75 milligram of iron per 100 Calories. Comparable results were obtained by Leichsenring and Flor (14) in a like experiment on 4 children ranging from 35 to 56 months of age. The allowance suggested by these investigators is 0.62 milligram of iron per 100 Calories.

The discovery of vitamins was not made until the beginning of the twentieth century. In 1928 Rose (20) summed up the situation thus: "Twenty years ago the word vitamin had not been coined, and the idea which it connotes--minute quantities of substances which are to the human machine what the ignition spark is to the automobile--had scarcely been formulated." Today, the existence of vitamins A, B, C, G, D, and E and their importance for growth and maintenance has been definitely established.

Though it is commonly recognized that these vitamins are essential for the well being of the individual, vitamin requirements cannot yet be stated in quantitative terms. However, by means of experimental work on animals, certain foods have been found to be of varying degrees of potency in one or more of the vitamins. From this information, Sherman (26) and Rose (20) have formulated tables indicating the relative importance of various foods as vitamin sources.

Since there is no definite standard for vitamin requirements, nutrition workers suggest including an abundance of milk, vegetables, fruits, and eggs in the diet as a means of assuring the presence of sufficient vitamins. Sherman states, "Quantitative studies of vitamin values of foods are developing rapidly and some teachers of dietetics are beginning to set dietary standards for vitamin units. But the basis for such standards will probably be less direct than with standards for energy, protein, calcium, phosphorus, and iron." He suggests that judgment will have to play a larger part in the matter of standard allowances for vitamins than for the factors mentioned above.

Since cost of food varies with economic conditions, it is difficult to determine how much money should be spent for food and what the cost distribution for groups of food should be at any given time. From dietary studies made by the United States Bureau of Labor, the New York Association for Improving the Condition of the Poor, and the United States Department of Agriculture, Sherman (26) made the following summary of the distribution made by the average American family of the total food allowance for various items: 30 to 35 per cent for meat and fish; 5 to 6 per cent for eggs; 8 to 10 per cent for milk; 7 to 12 per cent for butter and other fats; 10 to 20 per cent for bread and cereals; 3 to 7 per cent for sugars and other sweets; less than 2 per cent

for cheese and nuts.

During the world war the United States Food Administration (26) published as part of its educational program, a simple guide for the family food budget. It recommended that approximately 1/5 of the total money spent for food be used for each of the following groups:

1. Vegetables and fruits
2. Milk and cheese
3. Meats, fish, and eggs
4. Bread and cereals
5. Fats, sugars, and other groceries

Sherman (26) recommends spending as much for milk, including cream and cheese, as for meats, poultry, and fish; and at least as much for fruits and vegetables as for meats, poultry, and fish.

## PROCEDURE

A weighed individual dietary study was made for a 7-day period of the food eaten by each member of a group of 6 people living in Manhattan, Kansas. The subjects consisted of a family of 4 including an adult man and woman, a girl of 9 and a boy 6 years of age. In addition to the family, a student girl working in the home and the graduate student conducting the study were included in the group. The family was unusually well suited for such an experiment because of

their interest in the problem. The man was a college professor with some knowledge of nutrition and the woman was a Home Economics graduate. Excellent cooperation was shown by each subject throughout the period.

The heights of the subjects were taken at the beginning of the experiment. Each individual weighed himself at the same time each morning and recorded his weight (Table I) on a chart placed near the scales.

Records were kept for each person of the total amount of food eaten at every meal and in between meals during the experimental period (Table II).

Small articles of food were weighed on 2 Chatillon balances of 500 and 1000 grams capacity respectively. A torsion balance was employed for weighing heavier materials.

The data for commercial foods used, as bread and ice cream, were secured from the producer, which made it possible to calculate their nutritive value.

The weight of each ingredient used in the preparation of home-cooked foods, the total weight of each food after cooking, and the amount of the individual servings were recorded.

Additional servings were weighed as they were requested.

The weight of food not eaten was subtracted from that served.

TABLE I

DAILY WEIGHT RECORD WITHOUT CLOTHING

| Day | Subject A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| | lb. | lb. | lb. | lb. | lb. | lb. |
| Thursday | 174.0 | 125.25 | 66.0 | 46.75 | 126.75 | 128.75 |
| Friday | 174.5 | 124.50 | 66.5 | 46.00 | 125.50 | 128.00 |
| Saturday | 173.0 | 124.25 | 67.5 | 46.50 | 125.24 | 126.75 |
| Sunday | 174.0 | 125.00 | 67.0 | 46.50 | 125.50 | 127.00 |
| Monday | 173.5 | 125.00 | 65.5 | 46.00 | 125.00 | 127.50 |
| Tuesday | 173.0 | 125.00 | 66.5 | 46.25 | 126.00 | 127.50 |
| Wednesday | 173.0 | 125.75 | 66.5 | 46.25 | 126.50 | 128.00 |
| Average | 173.5 | 125.20 | 66.5 | 46.40 | 125.75 | 127.60 |
| | kg. | kg. | kg. | kg. | kg. | kg. |
| Average | 78.9 | 56.9 | 30.3 | 21.2 | 57.2 | 58.0 |

TABLE II

MENUS SERVED DURING THE WEEK - JULY 9-15, 1931

| Day | Breakfast | Lunch | Dinner | Extras: Items | Extras: Subjects Using |
|---|---|---|---|---|---|
| Thur. | Rice Krispies | Sandwiches (bacon, | Fried chicken | Lemon juice | B |
| | Shredded Wheat | tomato & lettuce) | Steamed potatoes | Orange | B,C,C,E,F |
| | Cream | Cocoa | Steamed carrots | Orange-ade | B,F |
| | Toast | | Cabbage salad | Root Beer | A,C,D,F |
| | Butter | | Bread | Nuts | B |
| | Milk-subjects C,D | | Butter | Cream | B |
| | Coffee | | Cherry pie | | |
| | | | Milk-subjects C,D | | |
| Fri. | Fresh pineapple | Macaroni and cheese | Roast beef | Orange-ade | D,D,C,A,B |
| | Rice Krispies | Stewed tomatoes | Steamed potatoes | Root Beer | D,C |
| | Shredded Wheat | Graham muffins | Buttered beets | Orange | C |
| | Cream | Butter | Vegetable salad | | |
| | Toast | Orange marmalade | Raw carrots | | |
| | Butter | Ice box cookies | Bread | | |
| | Milk-subjects C,D,F | Milk-subjects C,D,F | Butter | | |
| | Coffee | | Cherry sauce | | |
| | | | Ice box cookies | | |
| | | | Milk-subjects C,D,F | | |
| Sat. | Cherry sauce | Steamed eggs | Beef hash | Root Beer | C,D |
| | Rice Krispies | Sliced tomatoes | String beans | Orange | C,F |
| | Shredded Wheat | Bread | Lettuce salad | Orange-ade | C,D,D |
| | Cream | Butter | Bread | | |
| | Toast | Ice cream | Butter | | |
| | Butter | Cake | Sponge cake | | |
| | Milk-subjects C,D,F | Milk-subjects C,D,F | Milk-subjects C,D,F | | |
| | Coffee | | | | |
| Sun. | Banana | Steamed eggs | Lamb chops | Root Beer | C,A |
| | Orange | Bread | Baked potatoes | Orange | |
| | Rice Krispies | Butter | Steamed carrots | | |
| | Shredded Wheat | Cocoa | Steamed onions | | |
| | Cream | | Vegetable salad | | |
| | Cinnamon roll | | Fruit cup | | |
| | Butter | | Ice box cookies | | |
| | Milk-subjects D,F | | Milk-subjects C,D,F | | |
| | Coffee | | | | |
| Mon. | Banana | Beef hash | Cheese souffle' | Root Beer | A,B,C,E |
| | Orange | Cucumber & lettuce | Sweet potatoes | Orange-ade | B,D |
| | Rice Krispies | salad | Buttered peas | Marshmallows | D |
| | Shredded Wheat | String beans | Sliced tomatoes | Milk | D |
| | Cream | Rice pudding | Whole wheat bread | Grapes | C,D,A |
| | Cinnamon roll | | Butter | | |
| | Butter | | Apple sauce | | |
| | Milk-subjects C,D,F | | Ice box cookies | | |
| | Coffee | | Milk-subjects C,D | | |
| Tue. | Blackberries | Sandwiches (bacon, | Roast pork | Orange-ade | C,C,D,B,F |
| | Rice Krispies | lettuce & tomato) | Roast potatoes | Root Beer | C,C,D |
| | Shredded Wheat | Lemon bread pudding | Steamed carrots | Marshmallows | C |
| | Cream | Milk-subjects C,D | Bread | Fruit juice | |
| | Toast | | Butter | and graham | |
| | Butter | | Apple sauce | crackers | D |
| | Milk-subjects C,D,F | | Chocolate cup cakes | | |
| | Coffee | | | | |
| Wed. | Blackberries | Steamed eggs | Roast pork | Orange | F |
| | Rice Krispies | Sweet corn | Potato salad | Orange-ade | F,C,B |
| | Shredded Wheat | Whole wheat bread | Sliced tomatoes | | |
| | Cream | Butter | Bread | | |
| | Muffins | Lemon pie | Butter | | |
| | Milk-subjects C,D,F | Milk-subjects C,D,B | Apple sauce | | |
| | Coffee | | Chocolate cup cakes | | |
| | | | Milk-subjects C,D,F | | |

Each person recorded on a chart hung near the water supply the number of glasses of water he drank daily.

The original plan was for the housewife to do all the actual cooking because it was desired to maintain the usual household routine. This did not prove practical from the standpoint of efficiency. Since the housewife was accustomed to directing student help and to frequent change of helpers, it was arranged so she planned the meals, selected the recipes, and supervised the cooking while the investigator and her assistant prepared the food. The usual living conditions were thus approximated and the appetite of the various subjects affected little if any by the change.

The following methods increased the speed of service and aided in the weighing and calculating:

All serving dishes and glasses were marked with the initials of the subjects in ink on a piece of adhesive tape or directly, by means of a china pencil.

Servings of butter were weighed and placed in the ice box on a marked plate. Weighed servings of bread were stacked until needed in a regular order between layers of waxed paper. These servings were placed on individual bread and butter plates just before meal time.

Sugar and cream for each subject were weighed in small glasses.

Salads were weighed in individual portions on a paper plate divided into sections, each of which was marked with the initials of a subject. At serving time, the salads were slipped onto salad plates and the dressing weighed as it was poured over the food.

Cake and cookies were also weighed and placed on marked plates in a similar manner.

Each subject was given the same number of grams of milk, jelly, fruit sauces, cookies, and puddings. This had little effect on the food intake and simplified calculations. Whenever this method slowed down the serving or when a smaller individual portion was advisable, the practice was discarded.

The top 6 ounces of milk were taken from each bottle by means of an ounce cream dipper. The remainder was considered to be skimmed milk.

For breakfast service, the food was weighed after each individual indicated his choice of menu. This was possible because of an irregular breakfast hour.

During food preparation, the Chatillon balance was placed on a solid base so the dial was on a level with the eye. This prevented unnecessary physical discomfort. When it was necessary to weigh the food at the table, the investigator sat on a low stool.

Lunch and dinner foods were served from a small table placed in the kitchen. The investigator weighed the serv-

ings, the assistant recorded the weights, and the student helper took the served plates to the table. During the meal, the investigator prepared the extra servings as requested.

It was desired to determine the number of Calories, the grams of protein, fat, carbohydrate, calcium, phosphorus, and iron supplied in the individual diets when appetite governed the food intake. It was also desired to compare the above factors with accepted standards.

Calculations were made by means of the Rose (21) and Bradley (5) tables. Weights of food as purchased, of the edible portion, and of the cooked product were found to be necessary in making calculations. The food analyses of Rice Krispies and Vegetized Macaroni were secured from the manufacturer.

Results thus obtained for individual diets were compared with standards set by Sherman (26), Rose (20), Holt and Fales (12), and Hawley (7).

Lack of definite knowledge as to the amount of vitamins in the foods used made an exact record impossible. The frequency of the occurrence of vitamins was determined by means of Sherman's (26) table. This was accomplished by counting the number of excellent and good sources of vitamins A, B, C, and G appearing in the diet.

The cost of the family food was compared with the percentage distribution for various food groups, recommended by the United States Food Administration (26). (Table III).

## RESULTS AND DISCUSSION

The method used in conducting this study has been given in detail in order that it might be of help in other studies of this kind. There is a need for more analyses of cooked products. With the present data available, the results on servings of cooked meats and vegetables would be more accurate if these foods could be prepared so as to serve all meat juices and vegetable stock with the cooked food. Thus, no food materials would be destroyed with the liquid. However, food served in this way might affect appetite and vary results to a greater extent than the loss of food elements in cooking. Difficulty was experienced in obtaining necessary information concerning some commercial products. If it were possible to have the menus made prior to the experimental period, the investigator could be assured that analyses were available for every food appearing in the dietary.

Sherman (26) suggests that the fatness of an individual is an index to the adequacy of the amount of food eaten. When the weights of the subjects of this study were compared (Table IV) with the Wood (21) and the Baldwin and Wood (21)

TABLE III

DISTRIBUTION OF FOOD COST

| Food Groups | This Dietary | Recommendation of Food Administration | Variation | Sherman Summary* |
|---|---|---|---|---|
| | per cent | per cent | per cent | per cent |
| 1. Fruits and vegetables | 31.2 | 20 more or less | +11.0 | 9 - 18 |
| 2. Milk and cheese | 14.7 | 20 or more | -5.3 | 10 - 12 |
| 3. Meat, fish, and eggs | 24.9 | 20 or less | +4.9 | 35 - 37 |
| 4. Cereals and bread | 10.2 | 20 or more | -9.8 | 10 - 20 |
| 5. Sugars, fats, and other groceries | 18.9 | 20 or less | -1.2 | 10 - 19 |

Food cost per day:

| | |
|---|---|
| per person ------- | $0.452 |
| per male unit ---- | 0.592 |
| per 100 Calories - | 0.021 |

* The distribution in the average American family.

TABLE IV

WEIGHT*, HEIGHT, AND ACTIVITY OF THE INDIVIDUAL MEMBERS OF THE GROUP STUDIED

| Subject | Age | Height | Weight | Average Weight | Deviation from Average | Daily Activity |
|---|---|---|---|---|---|---|
| | years | inches | kg. | kg. | per cent | |
| A. College professor | 35-39 | 68.2 | 79.3 | 70.4 | +12.7 | Out door work of a supervisory nature at the college<br>Tennis - 1 hour<br>Swimming - 1/2 hour |
| B. Housewife | 35-39 | 62.5 | 57.2 | 58.4 | -2.1 | Washing, ironing, or cleaning<br>Marketing<br>Supervising cooking<br>Swimming - 1/2 hour |
| C. Girl | 9 | 53.5 | 30.4 | 31.3 | -2.9 | Active out door play<br>Dancing or art lesson<br>Swimming - 1/2 hour |
| D. Boy | 6 | 45.0 | 21.2 | 20.9 | +1.0 | Active out door play<br>Swimming - 1/2 hour |
| E. Student helper | 23-24 | 63.75 | 57.6 | 57.3 | +0.5 | Work in the home - 4 hours<br>Work at the college - 6 hours<br>Swimming - 1/2 hour as part of school work |
| F. Investigator | 30-34 | 63.5 | 58.4 | 58.2 | +0.35 | Entire waking time spent in more or less active physical work connected with the experiment |

* One pound was added to the nude weight of each subject as an allowance for clothing to make the weights comparable to those in the Wood (21) and Baldwin and Wood (21) tables

tables, they were found to vary only slightly from that of the average individual of like age, height, and sex, with the exception of subject A who was 12.7 per cent overweight. It may then perhaps be assumed that the accustomed diet was adequate as to energy so far as the adults included in this study were concerned. There was no gain shown in the weights of the children during the week covered by this study but the experimental period was too short for this fact to be of any significance.

The daily program of each individual indicated that he engaged in at least a moderate amount of activity. Some out door work and an hour of tennis were included in the daily schedule of the college professor. The housewife did her own work, including washing and ironing, with the exception of the help given by the student girl and the food preparation which was done by the investigator and her assistant. The boy and girl spent a large share of the day in active out door play. The student helper worked 4 hours in the home and spent 6 hours at the college daily. These 5 members of the group went swimming for at least 1/2 hour each day. The physical work connected with the experiment was more or less active and filled the entire waking time of the investigator. Thus, it seems unlikely that the activity of each person was less than moderate.

Each subject with the exception of C received fewer Calories (Table V) than the standard requirement suggested for individuals of like activity. When the group was converted into adult male units (7) the amount of food consumed per capita per day was found to be 2818 Calories which is 6 per cent under Sherman's (26) standard of 3000 Calories. Since the study was made during the month of July, the effect of excessively high temperature may partially explain the low Calorie intake. According to Sherman (26), "Climate, season, housing, and clothing are all factors which may influence energy metabolism, principally through their bearing upon the regulation of body temperature." The Calorie intake of these subjects is in accord with the results of other studies which show a lowered metabolism when the subjects were living in a warm climate.

When compared with Sherman's (26) standard of 1 gram per kilogram per day the protein in the diet of each adult except subject A was adequate as to quantity. In this individual diet, the protein was 6 per cent below the amount suggested as desirable. The protein in the diet of subject D, 6 years of age, was equal to the Holt and Fales (12) standard of 2.6 grams protein per kilogram for children of 6 years or older, while that in the diet of subject C, 9 years of age, was 27 per cent below this standard. However,

TABLE V

THE AVERAGE DAILY FOOD CONSUMPTION OF THE INDIVIDUAL MEMBERS OF A FAMILY GROUP

| Subject | | Calories | Protein | Fat | Carbohydrate | Calcium | Phosphorus | Iron | Excellent and good sources of vitamins: Times appearing in diet | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | gm. | gm. | gm. | gm. | gm. | gm. | A | B | C | G |
| | | | | | | | | | No. | No. | No. | No. |
| A | Average | 2667 | 72.8 | 103.3 | 361.1 | 0.510 | 1.063 | 0.01316 | 9 | 10 | 3 | 9 |
| | Standard | 3345 | 78.9* | | | 0.750 | 1.470 | 0.01500 | | | | |
| B | Average | 2223 | 57.5 | 87.2 | 301.9 | 0.586 | 0.890 | 0.01070 | 8 | 9 | 2 | 8 |
| | Standard | 2400 | 56.9* | | | 0.551 | 1.075 | 0.01500 | | | | |
| C | Average | 1970 | 57.2 | 67.9 | 282.6 | 1.071 | 1.188 | 0.00929 | 9 | 13 | 4 | 11 |
| | Standard | 1800 | 78.8† | | | 1.000 | 1.000 | 0.01500 | | | | |
| D | Average | 1719 | 54.6 | 50.2 | 261.6 | 1.141 | 1.127 | 0.00774 | 7 | 11 | 3 | 10 |
| | Standard | 1800 | 54.9† | | | 1.000 | 1.000 | 0.01500 | | | | |
| E | Average | 2292 | 60.9 | 89.6 | 310.2 | 0.550 | 0.903 | 0.00988 | 8 | 9 | 2 | 8 |
| | Standard | 2400 | 58.0* | | | 0.554 | 1.081 | 0.01500 | | | | |
| F | Average | 2093 | 64.0 | 81.2 | 276.3 | 0.885 | 1.151 | 0.01069 | 9 | 11 | 3 | 9 |
| | Standard | 2400 | 58.0* | | | 0.563 | 1.096 | 0.01500 | | | | |
| | Average per male unit | 2818 | 80.0 | 104.0 | 390.0 | 1.030 | 1.370 | 0.01336 | | | | |
| | Standard per male unit | 3000 | 70.0 | | | 0.680 | 1.320 | 0.01500 | | | | |

* Sherman standard
† Holt and Fales standard

each individual received from 10.6 to 12.2 per cent of his total Calories in the form of protein. Rose (20) says, "The needs of both active adults and elderly people as well as those of children will be met by an allowance of from 10 to 15 per cent of the total Calories in the form of protein, except when the Calories are unusually reduced as in cases of obesity or illness." Judged by these standards, this family diet probably supplied enough protein.

Each individual diet furnished as much calcium and phosphorus as Sherman's (26) suggested minimum requirement but did not in every case allow for the margin of safety believed to be desirable.

The diet of subject A (Table VI) was below Sherman's (26) standard in calcium, phosphorus, and iron as well as protein and Calories. An increase in the Calories to the standard would have made the quantity of iron, phosphorus, and protein equal to the amount suggested. Even with this increase in the Calories, the calcium content of this diet would still have been low. The small amount of this mineral was probably partially due to the fact that this subject used very little milk. The fact that the above food factors in this diet were below the suggested standard does not necessarily mean that they were not adequate to meet the needs of the individual. There is a growing feeling on the part of

TABLE VI

THE DAILY FOOD CONSUMPTION OF SUBJECT A

| Day | Calories | Protein | Fat | Carbohydrate | Calcium | Phosphorus | Iron |
|---|---|---|---|---|---|---|---|
| | | gm. | gm. | gm. | gm. | gm. | gm. |
| Thursday | 2635 | 61.7 | 95.0 | 379.9 | 0.567 | 0.772 | 0.00944 |
| Friday | 2334 | 78.0 | 78.6 | 327.9 | 0.561 | 1.187 | 0.01337 |
| Saturday | 2696 | 74.6 | 97.9 | 381.0 | 0.416 | 0.963 | 0.01433 |
| Sunday | 2429 | 77.6 | 93.8 | 319.2 | 0.607 | 1.143 | 0.01449 |
| Monday | 2276 | 58.5 | 70.6 | 351.8 | 0.558 | 0.958 | 0.00937 |
| Tuesday | 2748 | 63.8 | 118.1 | 357.0 | 0.445 | 0.947 | 0.01121 |
| Wednesday | 3547 | 95.3 | 169.3 | 411.1 | 0.417 | 1.472 | 0.01989 |
| Average | 2667 | 72.8 | 103.3 | 361.1 | 0.510 | 1.063 | 0.01316 |
| Standard | 3345 | 78.9 | | | 0.750 | 1.470 | 0.01500 |
| Average per kg. | 33.8 | 0.9 | | | 0.006 | 0.014 | 0.00019 |
| Standard per kg. | | 1.0 | | | 0.010 | 0.019 | 0.00021 |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| Calories | | 10.9 | 34.9 | 54.2 | | | |
| Deviation from standard | -20.0 | -7.7 | | | -25.0 | -19.4 | -13.0 |

nutrition workers that the present standard for Calories may be too high. The results of recent dietary studies are in keeping with this idea.

The phosphorus and iron in the diet of subject B (Table VII) were also below Sherman's (26) standard. A larger Calorie intake per kilogram than that of subject A may account partly for the adequacy of calcium in this case. Subject B ate very little whole grain cereals which may help explain the low phosphorus and iron content of the diet. An increase in the Calories to the standard amount for this subject would have made the quantity of neither phosphorus nor iron equal to the standard suggested as desirable.

The diet of subject C, the 9 year old girl (Table VIII), was adequate in all respects except for iron and possibly protein, as explained above. The diet supplied less iron than the usual standard and was found to be below Rose's (22) recommendation of 0.75 milligram per 100 Calories and similarly, those of Leichsenring and Flor's (14) of 0.62 milligram per 100 Calories suggested as the result of iron balance experiments on children. The effects of a free use of milk were noticeable in the high calcium and phosphorus content of this diet in comparison with those of subjects A, B, and E whose food supplied little milk.

In the diet of subject D, the 6 year old, (Table IX)

TABLE VII

THE DAILY FOOD CONSUMPTION OF SUBJECT B

| Day | Calories | Protein | Fat | Carbo-hydrate | Calcium | Phosphorus | Iron |
|---|---|---|---|---|---|---|---|
| | | gm. | gm. | gm. | gm. | gm. | gm. |
| Thursday | 2682 | 62.1 | 104.8 | 371.7 | 0.708 | 0.912 | 0.01065 |
| Friday | 2048 | 60.5 | 79.7 | 273.4 | 0.580 | 0.991 | 0.01168 |
| Saturday | 1870 | 61.0 | 73.4 | 240.9 | 0.395 | 0.833 | 0.01261 |
| Sunday | 2289 | 62.0 | 75.0 | 343.7 | 0.885 | 0.997 | 0.01127 |
| Monday | 2056 | 49.7 | 87.8 | 264.4 | 0.650 | 0.864 | 0.00844 |
| Tuesday | 2241 | 52.5 | 91.4 | 301.7 | 0.358 | 0.730 | 0.00913 |
| Wednesday | 2371 | 54.8 | 98.3 | 317.4 | 0.523 | 0.904 | 0.01111 |
| Average | 2223 | 57.5 | 87.2 | 301.9 | 0.586 | 0.890 | 0.01070 |
| Standard | 2400 | 56.9 | | | 0.551 | 1.075 | 0.01500 |
| Average per kg. | 39.1 | 1.01 | | | 0.0103 | 0.016 | 0.00019 |
| Standard per kg. | 42.9 | 1.00 | | | 0.0097 | 0.019 | 0.00021 |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| Calories | | 10.4 | 35.3 | 54.3 | | | |
| Deviation from standard | -7.4 | +1.0 | | | +6.3 | -17.0 | -10.0 |

TABLE VIII

DAILY FOOD CONSUMPTION OF SUBJECT C

| Day | Calories | Protein | Fat | Carbo-hydrate | Calcium | Phosphorus | Iron |
|---|---|---|---|---|---|---|---|
| | | gm. | gm. | gm. | gm. | gm. | gm. |
| Thursday | 2125 | 67.2 | 63.8 | 320.0 | 1.071 | 1.194 | 0.00933 |
| Friday | 1707 | 62.6 | 51.3 | 248.2 | 1.388 | 1.426 | 0.01699 |
| Saturday | 1876 | 66.6 | 69.3 | 246.3 | 1.244 | 1.317 | 0.01040 |
| Sunday | 1828 | 29.8 | 59.1 | 296.5 | 0.577 | 0.676 | 0.00632 |
| Monday | 1592 | 54.2 | 54.8 | 219.4 | 1.168 | 1.147 | 0.00660 |
| Tuesday | 2405 | 58.6 | 89.3 | 341.6 | 0.972 | 1.192 | 0.00462 |
| Wednesday | 2257 | 61.0 | 87.6 | 306.2 | 1.079 | 1.363 | 0.01079 |
| Average | 1970 | 57.2 | 67.9 | 282.6 | 1.071 | 1.188 | 0.00929 |
| Standard | 1800 | 78.8 | | | 1.000 | 1.000 | 0.01500 |
| Average per kg. | 65 | 1.9 | | | 0.035 | 0.039 | 0.00031 |
| Standard per kg. | | 2.6 | | | | | |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| Calories | | 11.6 | 31.0 | 57.4 | | | |
| Deviation from standard | +9.4 | -27.0 | | | +7.0 | +19.0 | -38.0 |

TABLE IX

DAILY FOOD CONSUMPTION OF SUBJECT D

| Day | Calories | Protein | Fat | Carbo-hydrate | Calcium | Phosphorus | Iron |
|---|---|---|---|---|---|---|---|
| | | gm. | gm. | gm. | gm. | gm. | gm. |
| Thursday | 1563 | 55.2 | 44.7 | 234.6 | 1.116 | 1.071 | 0.00683 |
| Friday | 1849 | 58.7 | 52.6 | 286.9 | 1.157 | 1.221 | 0.00922 |
| Saturday | 1661 | 56.0 | 37.8 | 272.8 | 1.016 | 1.037 | 0.00853 |
| Sunday | 1345 | 50.8 | 36.9 | 204.1 | 1.127 | 1.082 | 0.00725 |
| Monday | 1721 | 51.5 | 46.6 | 272.8 | 1.313 | 1.183 | 0.00765 |
| Tuesday | 1953 | 49.6 | 50.3 | 323.9 | 0.936 | 0.991 | 0.00675 |
| Wednesday | 1939 | 60.4 | 83.1 | 236.3 | 1.321 | 1.305 | 0.00797 |
| Average | 1719 | 54.6 | 50.2 | 261.6 | 1.141 | 1.127 | 0.00774 |
| Standard | 1800 | 54.9 | | | 1.000 | 1.000 | 0.01500 |
| Average per kg. | 85.5 | 2.6 | | | 0.054 | 0.053 | 0.00037 |
| Standard per kg. | | 2.6 | | | | | |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| Calories | | 12.7 | 26.3 | 60.9 | | | |
| Deviation from standard | -4.5 | 0.0 | | | +14.0 | +13.0 | -48.0 |

the free use of milk again helped to furnish an abundance of calcium and phosphorus though the iron remained low as compared to the Sherman (26), Rose (22), and Leichsenring and Flor (14) recommendations.

Little milk was used by subject E (Table X) as was indicated by a low phosphorus and a relatively low calcium intake, the latter supplying very nearly the amount of the standard requirement. The small amount of phosphorus and iron in the diet may be partly explained, as in the case of subject B, on the basis of the use of few whole grain cereals. If the Calories had been increased sufficiently to meet the standard, the iron and phosphorus would still have been below the amount suggested as desirable.

The quantity of iron and the number of Calories in the diet of subject F (Table XI) were below the standard. An increase in Calories in keeping with the requirement would not have increased the iron sufficiently.

It is interesting to note that, while the amount of the phosphorus and calcium in the group diet was up to the standard per male unit, yet the individual diets of 3 adults showed a shortage of phosphorus and 1 was low in calcium. Such a study indicates the influence of appetite on the adequacy of the diet. It also makes clear that results are more accurate when the diet of each individual subject is

TABLE X

DAILY FOOD CONSUMPTION OF SUBJECT E

| Day | Calories | Protein | Fat | Carbo-hydrate | Calcium | Phosphorus | Iron |
|---|---|---|---|---|---|---|---|
| | | gm. | gm. | gm. | gm. | gm. | gm. |
| Thursday | 2050 | 52.5 | 75.6 | 289.5 | 0.535 | 0.778 | 0.00868 |
| Friday | 2302 | 66.9 | 83.8 | 321.0 | 0.766 | 1.107 | 0.01128 |
| Saturday | 2017 | 62.6 | 80.6 | 260.5 | 0.371 | 0.808 | 0.01171 |
| Sunday | 2061 | 58.6 | 80.4 | 274.5 | 0.456 | 0.763 | 0.00788 |
| Monday | 2417 | 56.5 | 87.6 | 351.3 | 0.778 | 0.898 | 0.00659 |
| Tuesday | 2741 | 71.6 | 108.9 | 366.9 | 0.592 | 1.031 | 0.01129 |
| Wednesday | 2457 | 57.3 | 110.7 | 307.8 | 0.353 | 0.933 | 0.01174 |
| Average | 2292 | 60.9 | 89.6 | 310.2 | 0.550 | 0.903 | 0.00988 |
| Standard | 2400 | 57.2 | | | 0.554 | 1.081 | 0.01500 |
| Average per kg. | 40.1 | 1.1 | | | 0.0097 | 0.01578 | 0.00017 |
| Standard per kg. | 42.9 | 1.0 | | | 0.0097 | 0.01890 | 0.00021 |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| Calories | | 10.6 | 35.2 | 54.1 | | | |
| Deviation from standard | -4.5 | +6.4 | | | -0.7 | -16.0 | -14.0 |

TABLE XI

DAILY FOOD CONSUMPTION OF SUBJECT F

| Day | Calories | Protein | Fat | Carbo-hydrate | Calcium | Phosphorus | Iron |
|---|---|---|---|---|---|---|---|
| | | gm. | gm. | gm. | gm. | gm. | gm. |
| Thursday | 1863 | 40.7 | 67.1 | 273.2 | 0.459 | 0.629 | 0.00752 |
| Friday | 2103 | 71.7 | 83.5 | 265.0 | 1.368 | 1.468 | 0.01130 |
| Saturday | 1998 | 79.2 | 75.4 | 250.0 | 1.085 | 1.435 | 0.01312 |
| Sunday | 2438 | 78.6 | 102.3 | 301.9 | 1.064 | 1.430 | 0.01249 |
| Monday | 1898 | 52.2 | 70.1 | 264.2 | 0.767 | 0.942 | 0.00816 |
| Tuesday | 2281 | 62.3 | 88.5 | 310.0 | 0.601 | 1.011 | 0.01028 |
| Wednesday | 2068 | 63.8 | 81.4 | 269.8 | 0.856 | 1.141 | 0.01199 |
| Average | 2093 | 64.0 | 81.2 | 276.3 | 0.885 | 1.151 | 0.01069 |
| Standard | 2400 | 58.0 | | | 0.563 | 1.096 | 0.01500 |
| Average per kg. | 36.08 | 1.1 | | | 0.0102 | 0.0198 | 0.00018 |
| Standard per kg. | 42.85 | 1.0 | | | 0.0097 | 0.0189 | 0.00021 |
| | per cent | per cent | per cent | per cent | per cent | per cent | per cent |
| Calories | | 12.2 | 34.9 | 52.8 | | | |
| Deviation from standard | -17.1 | +10.3 | | | +57.1 | +5.0 | -28.7 |

evaluated separately. (Plate I and Plate II)

The 3 quarts of milk used by the family daily probably were not adequate to insure the amounts of calcium and phosphorus believed desirable for each member of the group. According to Rose (20), "Milk has been shown to be a great protector of the diet at almost every point; of unique importance for calcium, phosphorus, and other mineral elements; and for vitamins A and B. Even in the adult diet, therefore, a liberal amount of milk should be included at all times. At least a pint a day is a good rule, with an increase to a quart as optional but desirable." Sherman (26) says that at least as much should be spent for milk and cheese as for meat. This study showed that 15 per cent more money was spent for meat alone than for milk and cheese. If these amounts had been equalized it, no doubt, would have increased the calcium and phosphorus in the individual diets of the adults.

Iron was the one necessary food requirement which was found to be below the standard in each case studied. (Plate III). Bogert (4) lists among iron-rich foods:

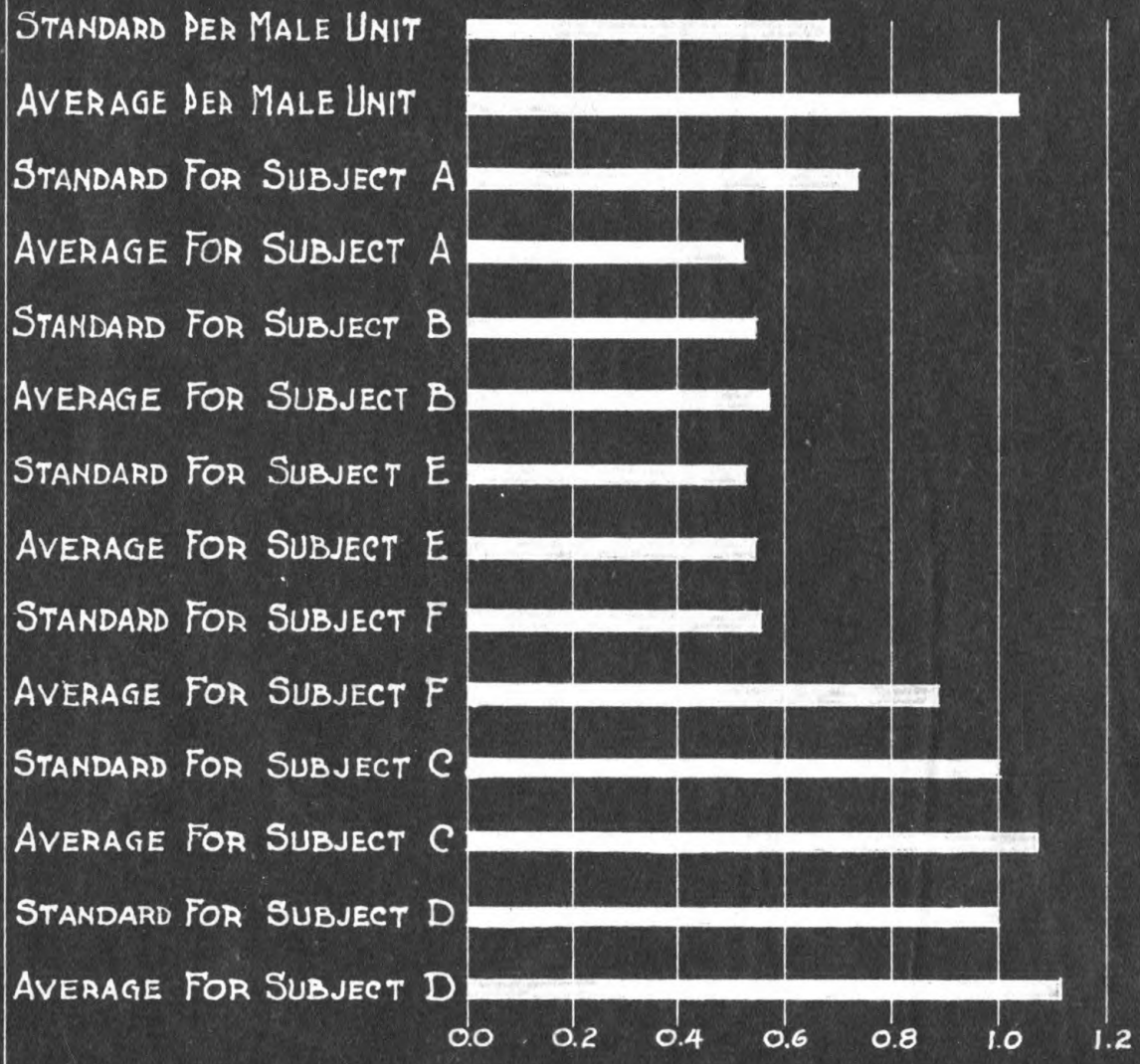
Egg yolk

Leafy vegetables, especially spinach and dried legumes

Fruits, especially dried dates, prunes, and figs

PLATE I

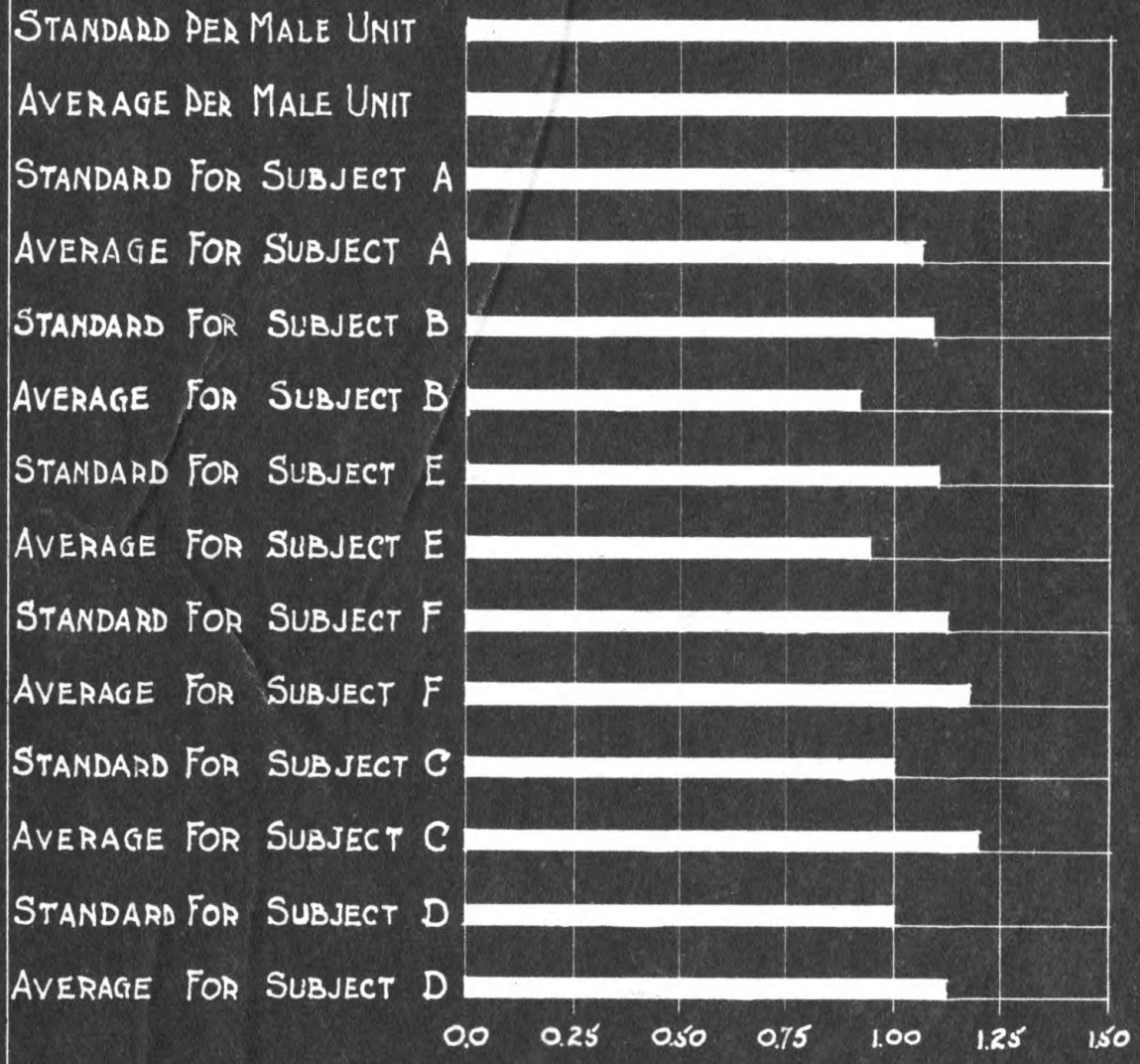
# CALCIUM




COMPARISON WITH THE STANDARD OF THE CALCIUM INTAKE PER MALE UNIT AND INDIVIDUAL, EXPRESSED IN GRAMS.

PLATE II

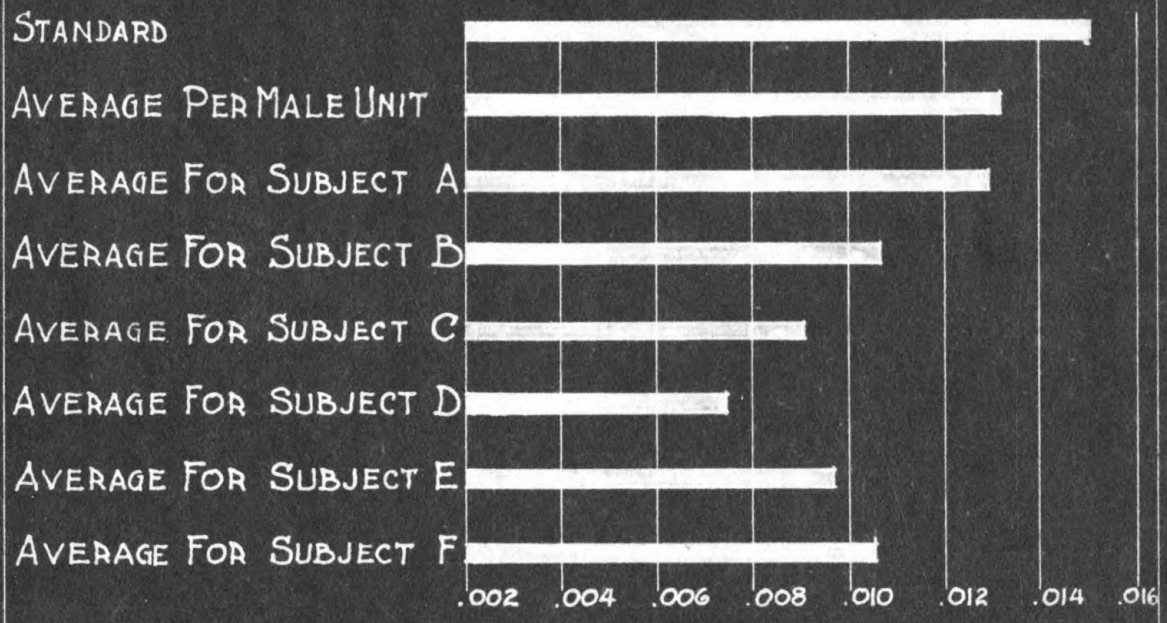
# PHOSPHORUS




COMPARISON WITH THE STANDARD OF THE PHOSPHORUS INTAKE PER MALE UNIT AND INDIVIDUAL, EXPRESSED IN GRAMS.

PLATE III

# IRON




COMPARISON WITH STANDARD OF THE IRON INTAKE PER MALE UNIT AND INDIVIDUAL, EXPRESSED IN GRAMS.

Meat, especially liver

Whole grain cereals

The weekly menu for this family included eggs only 3 times; no spinach or other leafy vegetable except lettuce; no liver; no dried legumes or dried fruits and only a small proportion of whole grain cereals. In this study, the cereal products used cost 12.2 per cent of the total expenditure for food as compared to the recommendation of the Food Administration of 20 per cent or more for cereals. Had more foods been chosen from the list of those rich in iron it would have assured a generous amount of this element in the family dietary.

It was found (Table XII) that the average number of excellent and good sources of vitamins supplied in the individual diets daily ranged from 7 to 13 for each of the vitamins A, B, and G, and from 2 to 4 for vitamin C. This record shows only that each of these vitamins was present in the diet. Sherman (26) states, "To be able to discuss vitamin intake in quantitative terms will be another important step in the evolution of dietetics to the status of an exact science. Meanwhile the presence of sufficient amounts of vitamins in the dietary is best assured by giving ample prominence to those foods which are known to be good sources, notably milk and its products, eggs, vegetables, and fruit."

TABLE XII

THE NUMBER OF EXCELLENT AND GOOD VITAMIN SOURCES IN EACH DIET*

| Subject | A | | | | B | | | | C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vitamin | | | | Vitamin | | | | Vitamin | | | |
| Day | A | B | C | G | A | B | C | G | A | B | C | G |
| | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. |
| Thursday | 8 | 11 | 5 | 11 | 6 | 6 | 2 | 6 | 7 | 12 | 5 | 11 |
| Friday | 9 | 8 | 4 | 7 | 10 | 9 | 4 | 8 | 11 | 13 | 6 | 11 |
| Saturday | 11 | 8 | 2 | 8 | 11 | 7 | 3 | 9 | 11 | 13 | 2 | 12 |
| Sunday | 7 | 9 | 3 | 8 | 8 | 8 | 3 | 8 | 7 | 10 | 4 | 9 |
| Monday | 12 | 11 | 6 | 9 | 10 | 10 | 3 | 7 | 10 | 13 | 3 | 9 |
| Tuesday | 6 | 9 | 2 | 9 | 6 | 8 | 1 | 7 | 8 | 13 | 4 | 12 |
| Wednesday | 8 | 13 | 2 | 10 | 7 | 12 | 1 | 9 | 8 | 16 | 2 | 12 |
| Daily average | 9 | 10 | 3 | 9 | 8 | 9 | 2 | 8 | 9 | 13 | 4 | 11 |

| Subject | D | | | | E | | | | F | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Vitamin | | | | Vitamin | | | | Vitamin | | | |
| Day | A | B | C | G | A | B | C | G | A | B | C | G |
| | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. | No. |
| Thursday | 5 | 8 | 2 | 8 | 7 | 8 | 3 | 7 | 8 | 10 | 4 | 9 |
| Friday | 11 | 13 | 5 | 12 | 8 | 9 | 4 | 8 | 8 | 11 | 2 | 10 |
| Saturday | 9 | 10 | 2 | 10 | 11 | 7 | 2 | 8 | 10 | 11 | 3 | 10 |
| Sunday | 6 | 11 | 5 | 12 | 8 | 8 | 3 | 8 | 10 | 13 | 4 | 10 |
| Monday | 8 | 11 | 3 | 9 | 11 | 11 | 3 | 8 | 10 | 11 | 3 | 9 |
| Tuesday | 6 | 12 | 3 | 11 | 6 | 9 | 1 | 8 | 7 | 11 | 2 | 9 |
| Wednesday | 6 | 13 | 1 | 10 | 7 | 12 | 1 | 9 | 8 | 13 | 3 | 10 |
| Daily average | 7 | 11 | 3 | 10 | 8 | 9 | 2 | 8 | 9 | 11 | 3 | 9 |

* Out door work and play in the sunshine probably provided sufficient vitamin D except in the case of subject F.

The abundant use of fruits and vegetables makes this dietary appear to supply sufficient vitamins with the possible exception of vitamin C which occurred relatively few times in the individual diets chiefly because the fruits and vegetables were often cooked.

Each subject, except the investigator, probably spent enough time out doors in the sunshine to supply a generous amount of vitamin D. The 7 days during which this subject was deprived of vitamin D is believed to be too brief a period to have had any effect on an adult.

Since it is assumed that the food eaten by this family during the experimental period was typical, except for slight seasonal variations, of the food consumed throughout the year; this study is believed to be a record of the kind and amount of food which maintained the members of a family group in apparent good health. Though an attempt has been made to compare the food consumed with recognized standards, it needs to be kept in mind that too much importance should not be given to the comparison. According to Sherman (26), "Dietary studies are records of fact while dietary standards are judgments involving assumptions."

## CONCLUSIONS

1. A definite plan of procedure is necessary for making a

weighed individual study of the food intake of a family and the cooperation of each member of the group is essential.

2. The diet of this family was adequate to maintain the subjects in apparent good health if it may be assumed that the food intake during the experimental period was typical of the usual food eaten.

3. Appetite apparently had an influence on food intake. When the subjects were converted into adult male units, the family dietary supplied more calcium and phosphorus per unit than the standards suggest. In spite of this fact, the individual adults, in some instances, selected food which was low in these factors.

4. With one exception this dietary supplied fewer Calories for each subject than the amount commonly believed to be desirable. This may have been due partly to the high temperature prevailing during the time of the study. It also appears to confirm a prevalent idea that the present standard for energy may be too high.

5. The protein in the diet was probably adequate though it was below Sherman's standard in the case of one adult and below Holt and Fales' standard in the diet of one child.

6. There was a tendency for the minerals to be deficient in

the diet. The iron was low in each case and the foods were not such as to provide a margin of safety for calcium and phosphorus. More milk in the family dietary and the use of more foods rich in iron would have assured an abundance of these 3 minerals.

7. The supply of vitamins A, B, G, and possibly C, appeared to be sufficient since some excellent and good sources of each of these vitamins were included in the daily food intake of each subject. Out door work and play in the sunshine probably provided an abundance of vitamin D except in the case of the investigator.

8. Even though the necessary food factors supplied in the individual diets were not equal to the usual standards in all respects, it would seem that they may have been present in sufficient amounts to meet the individual needs of the subjects, since each was of normal weight or above and was in apparent good health.

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