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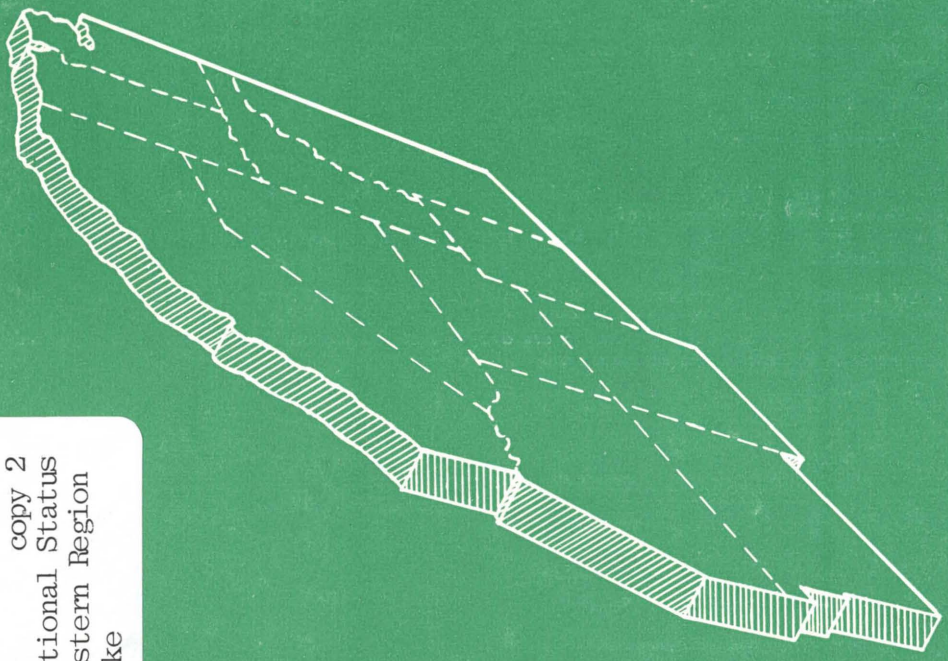
Cooperative Nutritional Status Studies in the Western Region

I. NUTRIENT INTAKE



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Under the procedure of cooperative publications, this regional report becomes, in effect, an identical publication of each of the cooperating agencies, and is mailed under the frank and indicia of each. Limited supplies of this publication are available at the sources listed above. It is suggested that requests be sent to one source only.

Summary

ASCORBIC acid was the nutrient most apt to be low in the diets of the children and adolescents although the diets of the adolescent girls were equally low in calcium and iron. This was shown in the 1134 seven-day diet records collected in seven western states.

Calcium was also frequently low in the diets of women over 50 years of age. Ascorbic acid intake was likewise low, though to a lesser extent, in the diets of the 664 women and men of this age group. Average intakes of all nutrients of the men and women under 65 years of age were, in general, greater than of those over 65 years of age.

Dietaries of the males of all ages were, in general, superior to those of the females with respect to all nutrients except ascorbic acid.

The mean nutrient intake of the adolescents of either sex was greater than the mean intake of the groups over 50 years of age of the same sex. However, when dietaries were compared with the NRC Recommended Dietary Allowances, more of the adolescent's diets contained less than two-thirds of the allowance for many of the nutrients than did the diets of the subjects over 50 years of age. The diets of the 69 younger children, ages 5 to 12 years, also compared better with the Recommended Allowances than did those of the adolscents.

Both boys and girls (ages 13-17) in Colorado and in the Spanish American group in New Mexico had somewhat lower intakes of many of the nutrients than did those in the other states. Colorado subjects over 50 years of age also consumed less of most of the nutrients than did those in California.

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COOPERATIVE NUTRITIONAL STATUS STUDIES IN THE WESTERN REGION

I. Nutrient Intake

Prepared by Ethelwyn B. Wilcox, Helen L. Gillum, and Margaret M. Hard

Introduction

IN 1947, a concerted study of the nutritional status of selected population groups was initiated in the western region of the United States. Previous dietary surveys had indicated that substantial portions of the country's population were consuming lower than recommended levels of essential nutrients. Deficiency diseases that may have nutritional background, such as dental caries, anemia, and rickets, existed. Investigators reported subclinical signs of malnutrition in several areas. Few studies had been made in the West, although reports of high incidence of dental caries and suspected undernutrition had come from several western states. The regional committee thought it evident that the presence of endemic nutritional deficiencies, imbalances, and excesses should be investigated within the western region, and their causes in environmental factors or food habits should be studied. Such conditions might be widespread and cross state lines. Hence the regional approach was appropriate.

In April 1947, the project "Nutritional status of population groups in selected areas of the West" was approved on funds made available by the Research and Marketing Act of 1946. In December of the same year, nutrition research leaders from Arizona, California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Washington, the Human Nutrition Research Branch, and the U. S. Public Health Service met to consolidate policies and methods of procedure.

An unique, over-all procedure was adopted. The regional funds available for this research were allotted to one or two experiment stations each year. Areas or segments of the population in which nutritional deficiencies were suspected had been defined in each cooperating state by preliminary studies. Following a pre-arranged schedule, detailed observations reflecting nutritional status were made in each selected area. The schedule was as follows:

Oregon phase	1947-48
California phase	1948-49
Southwest phase: Colorado, Arizona and New Mexico	1949-50
Utah-Idaho phase	1950-51
Montana-Washington phase	1951-52

The original plan called for a trained team consisting of nutritionist, biochemist, physician, dentist, medical technician, and nurse to progress from

state to state with all the necessary equipment in a mobile laboratory. Although the transfer of personnel proved to be impractical, the equipment was moved to the state or states actively engaged in the field work. In general, the plan was successful and provided a more intensive study in each state than otherwise would have been possible.

Medical, dental, biochemical, and dietary phases of nutritional status were investigated. Each state used similar details of procedure. To assist in maintaining uniformity in methods, the state project leaders participated in a practicum on special techniques for assaying nutritional status.

This report contains the food nutrient consumption of 69 children, 1134 adolescents, 41 adults, and 664 older adults.

Review of Literature

Western Region

FEW reports have appeared since 1940 on the dietary intake of population groups in the western region.

Children: Geiger and Thody (1952) visited 15 school cafeterias in San Francisco and checked 200 daily food records against the National Research Council's suggested food patterns. The cafeterias provided one third to one half of the daily food needs of the pupils.

Beal (1953) studied the nutritional intake of 46 Colorado children from 1 to 5 years old using the nutrition history method. She reported that total intakes of calories, carbohydrate, and fat increased during this age period. Protein intake reached a plateau between 18 and 36 months. The median intakes were close to the National Research Council Recommended Allowances. Calcium intake (Beal, 1954) rose up to 9 months of age, decreased between 2 and 3 years and increased again between 3 and 4 years. The phosphorus intake increased during the first year, then fell. Iron intake rose sharply during the first year, then decreased. From 2½ years to 5 years, the iron intakes of more than 75 percent of the children were lower than the National Research Council Recommended Allowances.

In New Mexico, Campbell et al. (1953) found a deficiency of ascorbic acid important in the development of spongy gums and red eyes in 231 school children. The children ranged in age from 7 to 19 years. That diets were generally low in ascorbic acid was reflected in low levels of ascorbic acid in the blood. Administration of vitamin C returned the blood values to normal and caused a slow but satisfactory response in the cure of the gingivitis.

Galloway (1954) evaluated seven-day dietary records of 84 adolescent girls and 68 adolescent boys in two Utah junior high schools for nutrient intake. She found iron and ascorbic acid intake low for the largest percentage of children. Calicium and thiamine also tended to be low when compared to the NRC Recommended Dietary Allowances. Breakfast contributed less to the daily dietary intake than the other meals in calories, protein, phosphorus, iron, vitamin A, riboflavin, and niacin.

Part of the western regional project was a nutritional status study of 117 Papago Indian children in Arizona

(Vavich **et al.**, 1954). Since the investigators found it impossible to obtain seven-day dietary records, the findings could not be included in this report. However, they obtained sufficient information to show that the Indians' intake of animal protein is low compared with average American standards. Fresh fruits and vegetables were used infrequently. Some wild greens were available during certain times of the year. Some families grew squash, corn, and other vegetables when weather conditions permitted. Otherwise, the main diet was composed of beans, sugar and sirup, coffee, lard or fat pork, tortillas made of corn or wheat, and small amounts of native foods such as the buds and fruit of cholla, and fruits of prickly pear and saguaro cactus.

In connection with the regional project also, Storvick **et al.** (1951) studied the food habits of native born and reared white school children from two geographic regions in Oregon. They obtained information from 739 children, 14, 15, and 16 years of age, by means of a 24-hour food intake record and dietary history. More than 60 percent of the children had dietaries which met or exceeded the NRC Recommended Allowances in all nutrients except iron and ascorbic acid. Less than 10 percent of the children had diets inadequate in protein, vitamin A, thiamine, riboflavin, and niacin. They observed no regional or age differences in the nutritive values of dietaries. The boys' dietaries were, in general, superior to those of the girls, except in ascorbic acid content.

College students: The diet histories of 595 Oregon State College freshmen were evaluated by Young and Storvick (1949). Sixty-four percent of the subjects had fair diets, 19 percent had good diets, and 17 percent had poor diets. Freshman men had better diets than freshman women.

Families: Hardy (1945) made a one-week study of the diets of 100 families in Snohomish County, Washington. The inventory-by-weight method was used. Calcium, riboflavin, calories, and niacin were the nutrients needed in larger amounts by the greatest number of families. One sixth of the families did not meet the National Research Council's recommendation for ascorbic acid. The diets of farm and other rural families were slightly better than those of city families. Income appeared to affect dietary adequacy.

Wilson and Esselbaugh (1952) studied the effect of nutrition education on the food habits of 10 family groups in Washington State. The 6 experimental and 4 control families consisted of 48 individuals, ranging in age from 3 to 78 years. Those families participating in the educational program showed consistent improvement in food patterns as well as improvement in intake of specific nutrients. The control families showed little improvement. Their food intake tended to reflect habit patterns.

A study of food habits in New Mexico between 1949 and 1952 (Hacker **et al.**, 1954) revealed that families did not use milk, protein-rich foods, vitamin-C-rich foods, whole-grain breads and cereals, and green and yellow vegetables in adequate amounts, while they used sweets excessively.

Industrial workers: Two studies in California (Wiehl, 1942; Turlay, 1943) revealed vegetables, citrus fruits, milk, and eggs frequently inadequate in the diets of aircraft workers. The median caloric intake was 2675 calories per day.

Older adults: No dietary studies on this age group were reported from the western region before the initiation of this study.

Nutritional Status Studies In Other Regions

Nutritional status studies of individuals corresponding to the western studies have been conducted in the other three regions of the United States.

Northeast Region (Project NE-4): Nutritionists collected dietary records in six states (New York, Maine, Rhode Island, West Virginia, New Jersey, and Massachusetts) and calculated them in terms of ten nutrients. Subjects (854 males and 950 females) included kindergarten, primary, secondary and college students, industrial workers, and pregnant women. Ascorbic acid was the most common deficiency. Low intakes of calcium, vitamin A, and riboflavin occurred frequently. Male subjects more nearly met the Recommended Allowances than did the females. The younger subjects appeared to be better fed than did the older ones (Tucker **et al.**, 1952).

North Central Region (Project NC-5): Reports, to date, emphasize the dietary intake of two age groups, school children and older women. Eppright **et al.** (1954) chose Iowa school children at random to represent 1128 rural schools, 108 city elementary schools, and 318 small town elementary and high schools. They obtained seven-day dietary records from 1188 children (586 boys and 602 girls) ranging in age from 6 through 18 years. The mean daily nutritive value of the diets of boys at most ages and of girls through 12 years approximated or exceeded the National Research Council's recommendations except for calcium. As was noted in the Northeast regional study, the boys appeared to have better diets than did the girls. With the exception of calcium, the boys tended to have larger mean intakes of food energy and nutrients at successive years. Intakes of girls 6 to 12 tended to increase; beyond 12 years they remained the same or decreased except for ascorbic acid.

It was noted that one half to two third of the breakfasts consumed by the Iowa school children were poor (Sidwell and Eppright, 1953). Both sexes and all age groups used milk in inadequate amounts. They used eggs and meat infrequently.

Beegle **et al.** (1954) reported weights of foods eaten per meal by 242 women, ages 30 to 92 years, from records collected in 6 North Central states (Iowa, Michigan, Minnesota, Nebraska, South Dakota, and Wisconsin). They used 3170 records. The younger women tended to eat more than did the older women. A decrease in serving size of nearly all foods occurred at age 70 and over.

Ohlson **et al.** (1950) have reported that total calories per 24 hours may be taken as an indication of the dietary adequacy of older women if the food selected is varied and some milk is included daily. Women under 70 required a minimum of 1600 to 1800 calories per day to be in balance for protein, calcium, and phosphorus. They found some indication that women more than 70 years of age may require fewer calories.

Mertz **et al.** (1952) have determined the daily average intakes of 7 essential amino acids for 18 older women ranging in age from the third to the seventh decade. The calculated energy of the self-selected diets was 850

to 2288 calories per day, the calculated protein was 21 to 93 grams per day. Methionine appeared to be the amino acid most often found to be low. The levels of isoleucine, leucine, lysine, threonine, and valine were equal to, or higher than, Rose's recommended levels. Phenylalanine intake was intermediate between that of methionine and the other amino acids. Similarily, Futrell **et al.** (1952) found methionine the limiting amino acid in the self-selected diets of four women.

Southern Region (Project S-15): Moschette **et al.** (1952) conducted a survey of 487 Louisiana school children between 8 and 11 years of age to determine their dietary intakes and nutritional status. More than 60 percent of the children met the NRC Recommended Allowance for all nutrients except ascorbic acid. One fourth of the children were consuming less than 90 percent of the NRC allowance for calories. In general, more of the 8- and 9-year-old children met the allowances than did the 10-and 11-year-age group.

A similar survey was made in the Blacksburg school district in Virginia by Dean **et al.** (1954). Of the 221 children studied 44 were colored. Again, it was found that the 8-and 9-year-old children of both races had more satisfactory food intakes than did the 10- and 11-year-olds. The mean daily intakes of ascorbic acid, calcium, vitamin A, calories, and riboflavin often fell below two thirds of the NRC Recommended Allowances.

Procedures

Subjects Studied

APPROXIMATELY 2000 subjects of both sexes and of age levels of 5-9, 10-12, 13-15, 16-17, 25-49, and 50 to 95 years were chosen for study in seven of the Western States: California, Colorado, Idaho, Montana, New Mexico, Utah, and Washington (table 1). Most of the subjects were either adolescents 13 to 17 years of age or were beyond the age of 50. One state, Utah, included 69 normal children from 5 to 12 years and 41 parents of these children who were between 25 and 49 years of age. In addition Utah studied 131 children with a history of rheumatic fever, but these results were not included in this report (Wilcox and Galloway, 1954). All states used comparable groups of males and females. New Mexico included a group of subjects with a typical Spanish American background. Idaho, Montana, and Washington restricted their selection of subjects to adolescents who had been born and reared in the areas chosen for study. In California the group chosen was from among persons 50 years of age and older who had not seen a physician for at least three months and were considered to be in reasonably good health.

Data obtained in Arizona and in Oregon are not included in the tabular material presented here because the methods used by these two states in the collection and calculation of their dietary data differed from those used by the other seven states. The studies done in these two states have been described elsewhere (Vavich **et al.**, 1954; Storvick **et al.**, 1951).

Collection of Dietary Data

Nutritionists obtained dietary information on standard forms with proce-

Table I. Distribution by age and sex of subjects studied in seven Western States

State	Age range	Males	Females	Total subjects
	years	number	number	number
California	50 - 95	215	274	489
Colorado	13 - 16	80	82	162
	50 - 89	79	96	175
Idaho	14 - 17	124	150	274
Montana	13 - 15	110	111	221
New Mexico				
Anglo American	14 - 17	26	37	63
Spanish American	14 - 17	44	61	105
Utah	5 - 12	35	34	69
	13 - 16	27	35	62
	25 - 49	20	21	41
Washington	14 - 16	124	123	247
Totals	5 - 95	884	1024	1908

Note: Of the 1134 subjects 13-17 years of age only 21 were 13 years old (7 boys and 14 girls) and 22 were 17 years old (12 boys and 10 girls).

dures adopted for the region. They used two methods for the collection of data, a food intake record for seven consecutive days and a dietary history to serve as a check on deviations from customary food habits and to obtain more specific information than could be obtained by one method alone. Examples of the forms used are reproduced in the appendix. Several states made minor modifications of these forms.

The seven-day food intake record: A nutritionist gave subjects preliminary instructions for keeping this record. She also taught them to determine the size of servings on a semi-quantitative basis (appendix). Seven forms were given to each subject, one for each day, and a sheet of instructions to be used as a reminder of those given by the nutritionist. The record form and the instruction sheet were modifications of those used by the United States Public Health Service. In order to reduce the chance of a "recall" record the nutritionist stressed the importance of recording the food intake meal by meal. In some states nutritionists supplied seven stamped and addressed envelopes to mail each day's record as soon as it was completed; in others they collected current records.

Calculation of Dietary Data

The nutrient values of the seven-day food intake records were calculated mechanically by the use of IBM cards. The Household Economics Research Branch of the U. S. Department of Agriculture uses this method and their master cards were supplied to the region. Different states prepared additional master cards as needed, using as sources of food values the Agricultural Handbook No. 8 by Watts and Merrill (1950), "Food value tables for calculation of diets" by Boyd et al. (1947), "Food values of portions commonly used" by Bowes and Church (1946), and in a few instances the values supplied by manufacturers of proprietary products.

Investigators calculated the values for calories, protein, carbohydrate, calcium, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid from the master cards. All the states except Washington calculated fat values from the calories that remained after deducting the caloric value of the protein, carbohydrate, and alcohol contained in the food and beverages consumed by the subject. Washington used a new set of the IBM cards that included values for fat.

Chloesterol values were calculated from the tables by Okey (1945) and from additional data furnished by her. The fat and protein from animal and vegetable sources were determined separately by segregating these values from animal sources and deducting them from the total values that had been obtained. The carotene and preformed vitamin A values were obtained in a similar manner, without taking into consideration the small amounts of carotene to be found in milk and eggs.

Subjects recorded vitamin and mineral supplements taken in the seven-day food intake records. The nutrient value of these supplements was calculated but was not included in the nutrient value of the diets as reported in this bulletin except for some age groups of Colorado subjects.

Results and Discussion

Mean Nutrient Intake By Age and Sex

Children and adolescents: The mean daily intake of calories and 11 nutrients by age and sex groups for each state are presented in table 2. Adolescent boys had greater mean intakes of most nutrients than those of either the younger or older males. The 10- to 12-year-old girls had mean intakes which were slightly higher for many of the nutrients than the mean intakes of the adolescent girls or older women. With the exception of ascorbic acid for the girls, which was somewhat low, mean values of nutrients for the children 12 years of age or younger were simliar to the intakes reported by New York for the same age and sex (Tucker **et al.**, 1952).

In the 13- to 15-year-old group, two groups of boys (Colorado and the Spanish American group in New Mexico) had somewhat lower intakes for many of the nutrients than those of the other states. The greatest differences between these groups and those in the other states were in calcium and thiamine consumption. Boys in Colorado and the Spanish American group in New Mexico had average intakes of 1.1 and 0.8 gm. of calcium and 1.2 and 1.2 mg. of thiamine, which were from one half to three fourths of the intakes generally found in the other states. All subjects of both sexes in this age group had somewhat low asorbic acid intakes with average values ranging from 53 to 85 mg. for the boys and 53 to 75 mg. for the girls. Other nutrient intakes of the girls tended to be low except for vitamin A and in some states riboflavin and niacin. In no one state did girls have better dietaries with respect to most of the nutrients than in the other states. Differences between the intakes of the girls in Colorado and the Spanish American group in New Mexico (ages

Table 2. Average intake of various nutrients by age and sex groups*

Station	Age group	No.	Calories	Protein	Carbohydrate	Fat	Cholesterol
	years			gm.	gm.	gm.	mg.
MALES							
Utah	5-9	21	2177±97	72±2.5	274±13	88±5	544±33
Utah	10-12	14	2518±125	87±3.5	298±19	107±6	629±38
Colorado	13-15	65	2448±65	87±2.5	305±10	97±3	593±24
Idaho		57	3100±110	103±4.0	.....±....	.....±....	804±35
Montana		110	3111±68	108±2.6	357±8	139±5	783±27
New Mexico							
Anglo American		14	3169±179	109±9.9	382±35	126±12	.....±....
Spanish American		32	2170±136	75±4.3	289±16	88±6	.....±....
Utah		21	2858±151	101±6.2	336±18	123±8	744±52
Washington		95	3114±68	104±2.5	358±8	141±4	802±26
Colorado	16-17	15	2620±208	94±7.7	318±28	106±10	558±61
Idaho		67	3110±90	105±3.0	.....±....	.....±....	782±32
New Mexico							
Anglo American		12	2671±268	99±6.8	339±29	120±9	.....±....
Spanish American		12	2625±180	81±6.2	357±25	97±8	.....±....
Utah		6	3494±180	117±4.8	453±37	135±6	671±84
Washington		29	3271±92	109±3.9	364±11	153±6	835±50
Utah	25-49	20	2798±152	100±5.6	334±19	119±8	932±61
California	50-54	40	2613±110	92±3.5	285±15	109±5	772±44
Colorado		9‡	2367±99	75±2.2	269±19	109±7	644±39
California	55-59	39	2624±94	95±4.0	285±13	113±5	886±50
Colorado		9	2455±255	82±7.7	286±34	111±12	644±78
California	60-64	34	2504±93	89±3.9	282±9	101±5	782±56
Colorado		18‡	2633±136	85±4.3	322±14	113±8	720±66
California	65-69	38	2370±87	80±3.3	277±11	97±5	753±58
Colorado		12	2000±109	68±3.2	237±15	85±7	589±96
California	70-74	33	2138±58	76±2.5	256±9	88±3	606±41
Colorado		13	2008±83	69±4.0	248±10	79±5	563±89
California	75-79	16	2160±127	77±5.2	254±16	85±6	626±62
Colorado		11‡	2009±163	70±5.8	252±28	81±6	527±76
California	80+	15	2223±145	75±6.2	261±20	93±7	624±55
Colorado		7‡	2100±181	61±5.4	275±27	82±9	534±10

*Figures indicate mean daily intake and standard error.

†Standard error of 0.05 or less.

‡Mean nutrient intake includes vitamin and/or mineral supplements for 1 to 3 subjects in each age group.

Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic acid
gm.	mg.	I. U. x 1,000	mg.	mg.	mg.	mg.
1.14±0.05	11±0.7	7.8±1.4	1.0†	2.1±0.1	11±0.6	64±6
1.30±0.09	12±0.6	7.9±1.3	1.3±0.1	2.3±0.1	14±0.5	73±8
1.06±0.05	13±0.4	6.3±0.6	1.2†	2.2±0.1	15±0.4	53±3
1.61±0.08	16±0.6	7.6±0.5	1.6†	2.8±0.4	17±0.6	83±5
1.51±0.05	15±0.4	7.0±0.3	1.6†	2.8±0.1	18±0.5	85±3
1.68±0.24	16±1.2	7.0±1.0	1.6±0.2	2.9±0.4	16±1.1	81±14
0.81±0.07	16±0.8	5.6±0.8	1.2±0.1	1.7±0.1	13±0.8	67±6
1.32±0.10	15±1.0	11.9±4.6	1.4±0.1	2.9±0.4	18±1.8	67±10
1.52±0.06	16±0.4	8.1±0.7	1.6†	2.7±0.1	18±0.5	84±4
1.13±0.14	14±1.0	4.8±0.6	1.3±0.1	2.3±0.3	16±1.6	50±6
1.54±0.07	16±0.5	6.5±0.4	1.6±0.1	2.7±0.4	18±0.6	86±6
1.29±0.13	15±1.4	6.6±1.4	1.4±0.1	2.5±0.2	16±1.1	67±10
0.88±0.08	18±1.6	6.3±1.6	1.3±0.1	2.0±0.2	16±1.7	80±10
1.81±0.14	16±0.9	5.8±0.5	1.9±0.2	3.2±0.2	19±1.6	56±8
1.57±0.10	17±0.6	7.3±0.9	1.7±0.7	2.8±1.5	19±0.8	77±10
1.19±0.11	16±1.0	9.2±1.0	1.5±0.1	2.5±0.2	17±1.0	63±8
0.93±0.06	15±0.7	9.5±1.0	1.2†	2.0±0.1	16±1.0	97±8
0.58±0.06	13±0.5	7.5±1.8	1.5±0.3	1.8±0.3	17±1.8	59±9
0.89±0.05	16±0.6	13.4±1.7	1.2†	2.1±0.1	17±0.8	97±7
0.72±0.09	13±1.4	7.8±1.7	1.1±0.1	1.8±0.2	15±1.4	55±8
0.90±0.06	15±0.6	13.5±2.5	1.2†	2.2±0.2	16±0.9	136±12
1.03±0.11	14±0.8	9.1±1.4	1.4±0.1	2.4±0.3	14±1.3	73±9
0.85±0.05	14±0.6	8.1±0.8	1.2†	1.9±0.1	14±1.1	89±8
0.72±0.08	12±0.9	4.6±0.7	1.0†	1.5±0.1	12±0.9	58±7
0.90±0.06	13±0.5	9.7±1.2	1.1†	1.9±0.1	13±0.6	95±9
0.76±0.09	11±0.8	6.3±0.8	1.0±0.1	1.5±0.2	11±0.8	51±5
0.73±0.06	15±1.0	13.6±3.6	1.2±0.1	2.0±0.3	16±1.4	103±15
0.70±0.08	12±1.0	6.1±0.9	1.0†	1.7±0.3	11±1.2	52±7
0.92±0.11	13±1.0	13.1±3.9	1.2±0.1	2.3±0.3	14±1.6	91±12
0.78±0.12	12±1.3	5.9±1.5	1.4±0.2	1.5±0.2	12±0.8	64±12

Table 2. Average intake of various nutrients by age and sex groups (cont.)

Station	Age group	No.	Calories	Protein	Carbohydrate	Fat	Cholesterol
	years			gm.	gm.	gm.	mg.
FEMALES							
Utah	5-9	18	1979±110	68±4.1	240±12	83±6	496±34
Utah	10-12	16	2415±106	80±3.9	287±16	105±6	588±37
Colorado	13-15	63	1887±53	65±2.1	238±7	76±2	418±17
Idaho		70	2120±60	73±2.0	.....±....	.....±....	523±20
Montana		111	2049±45	68±1.7	247±6	88±3	471±44
New Mexico							
Anglo American		19	1978±125	61±6.3	248±17	80±6	.....±....
Spanish American		33	2079±124	69±3.8	270±18	85±5	.....±....
Utah		25	2251±127	76±4.5	281±18	85±6	519±41
Washington		107	2142±48	74±2.0	243±5	96±3	585±18
Colorado	16-17	19	1847±106	61±3.7	230±13	76±5	364±32
Idaho		80	2100±60	71±2.0	.....±....	.....±....	496±20
New Mexico							
Anglo American		18	2405±142	78±5.2	295±19	102±6	.....±....
Spanish American		28	1961±132	68±4.6	270±14	80±6	.....±....
Utah		10	2176±184	75±6.1	266±21	90±9	469±49
Washington		16	2060±121	71±4.5	229±16	94±6	525±26
Utah	25-49	21	1885±88	67±3.5	229±12	76±5	545±55
California	50-54	45	1817±56	60±2.2	210±8	76±3	480±26
Colorado		14‡	1729±119	51±2.4	221±16	70±8	379±38
California	55-59	50	1742±59	62±2.8	209±7	71±3	485±28
Colorado		15‡	1713±89	56±3.2	208±12	70±6	439±52
California	60-64	55	1786±48	62±1.8	211±6	75±3	526±30
Colorado		13	1377±133	50±3.7	179±21	54±6	380±44
California	65-69	51	1815±49	64±2.2	216±6	76±3	531±29
Colorado		21‡	1595±94	53±3.0	199±12	65±3	395±48
California	70-74	37	1685±58	65±2.6	196±8	71±3	503±27
Colorado		18‡	1356±89	46±3.2	178±13	49±4	324±26
California	75-79	24	1514±72	53±2.9	189±12	60±3	410±37
Colorado		9‡	1478±97	54±5.3	175±16	63±5	396±65
California	80+	12	1426±91	47±3.2	183±14	55±4	349±46
Colorado		6‡	1400±143	42±4.5	183±22	60±6	349±66

†Standard error of 0.05 or less.

‡Mean nutrient intake includes vitamin and/or mineral supplements for 1 to 3 subjects in each age group.

Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic acid
gm.	mg.	I. U. x 1,000	mg.	mg.	mg.	mg.
1.00±0.06	10±0.7	6.6±0.9	1.0±0.1	1.9±0.1	11±1.0	57±6
1.12±0.06	14±1.5	7.1±1.3	1.2±0.1	2.2±0.2	14±1.3	54±6
0.77±0.04	10±0.4	5.3±0.4	1.0†	1.5±0.1	12±0.4	53±3
1.11±0.05	11±0.3	5.4±0.4	1.1†	2.0±0.1	12±0.4	75±5
0.90±0.03	10±0.4	5.2±0.2	1.0†	1.8±0.1	12±0.4	62±3
0.97±0.11	10±0.6	4.8±0.6	1.0±0.1	1.8±0.2	11±0.6	64±5
0.78±0.07	14±0.9	4.6±0.7	1.1±0.1	1.6±0.1	13±0.7	66±6
1.08±0.08	11±0.7	5.8±0.7	1.1±0.1	2.0±0.1	12±0.7	57±5
1.02±0.03	11±0.3	6.0±0.5	1.1†	1.9±0.1	13±0.5	71±4
0.77±0.08	9±0.4	4.1±0.4	0.9±0.2	1.4±0.1	11±0.5	40±4
1.05±0.04	10±0.3	5.6±0.4	1.0†	1.9±0.1	12±0.4	74±4
0.97±0.08	12±1.0	5.0±1.0	1.2±0.1	1.9±0.2	14±1.3	75±14
0.88±0.10	13±1.0	5.4±0.8	1.0±0.1	1.6±0.1	12±0.8	62±7
1.06±0.12	11±0.7	6.1±0.9	1.1±0.1	2.0±0.2	12±1.1	41±4
1.02±0.10	10±0.8	4.8±0.7	1.0±0.5	1.8±1.4	12±0.9	60±8
0.78±0.07	11±0.6	9.3±0.2	1.0†	1.8±0.2	12±0.7	57±6
0.56±0.03	10±0.4	6.6±0.4	0.9†	1.2±0.1	11±0.5	84±8
0.61±0.06	9±0.8	5.5±1.5	0.7±0.1	1.6±0.3	9±0.6	59±9
0.67±0.04	11±0.5	9.9±1.8	0.9†	1.6±0.1	11±0.7	90±7
0.53±0.06	10±0.6	9.4±1.1	1.1±0.2	1.7±0.2	13±1.8	69±9
0.66±0.03	11±0.3	9.4±1.4	0.9†	1.6±0.1	11±0.5	91±6
0.40±0.06	8±0.5	5.1±0.6	0.7†	1.0±0.1	9±0.6	57±5
0.68±0.03	11±0.4	8.8±1.7	0.9†	1.5±0.1	12±0.7	88±4
0.60±0.05	10±0.8	6.6±1.0	0.9±0.1	1.3±0.1	10±0.7	63±7
0.68±0.04	11±0.5	8.8±1.1	0.9†	1.3±0.1	12±0.6	89±5
0.48±0.05	8±0.6	5.6±0.9	0.8†	1.2±0.2	9±1.0	49±5
0.73±0.04	9±0.6	5.8±0.6	0.8†	1.4±0.1	8±0.8	59±6
0.54±0.08	9±0.9	4.5±0.9	1.1±0.2	1.6±0.3	12±2.0	61±8
0.51±0.05	9±0.7	6.6±1.4	0.9±0.1	1.1±0.1	9±0.8	92±17
0.37±0.07	9±0.6	7.8±1.8	1.3±0.4	1.6±0.5	11±3.0	52±13

Table 3. Combined means of nutrient intake by age and sex

Age group	No.	Calories	Protein	Carbohydrates	Fat	Cholesterol	Calcium	Iron	Vit. A	Thiamine	Riboflavin	Niacin	Ascorbic acid
years			gm.	gm.	gm.	mg.	gm.	mg.	I.U.x1,000	mg.	mg.	mg.	mg.
Males													
5-12*	35	2313	78	284	96	578	1.20	11	7.8	1.1	2.2	12	68
13-15	394	2913	100	340	118	744	1.39	15	6.5	1.5	2.6	17	77
16-17	141	3029	103	357	128	732	1.44	16	6.5	1.6	2.6	18	77
25-49*	20	2798	100	334	119	932	1.19	16	9.2	1.5	2.5	17	63
50-54	49	2568	89	282	109	748	0.86	15	9.2	1.2	2.0	16	90
55-59	48	2592	93	285	113	841	0.86	16	12.4	1.2	2.0	17	89
60-64	52	2549	88	296	105	760	0.95	15	12.0	1.2	2.3	16	114
65-69	50	2281	77	267	94	714	0.81	13	7.3	1.1	1.8	13	82
70-74	46	2101	74	254	85	594	0.86	12	8.7	1.1	1.8	12	83
75-79	27	2098	74	253	83	586	0.72	14	10.6	1.1	1.9	14	82
80 +	22	2184	70	265	90	595	0.88	13	10.9	1.2	2.0	13	82
Females													
5-12*	34	2184	74	262	93	539	1.06	12	6.8	1.1	2.0	12	56
13-15	428	2071	70	249	80	504	0.95	11	5.4	1.0	1.8	12	65
16-17	171	2082	70	259	87	444	0.98	11	5.3	1.0	1.8	12	65
25-49*	21	1885	67	229	76	545	0.78	11	9.3	1.0	1.8	12	57
50-54	59	1796	58	213	75	456	0.57	10	6.3	0.8	1.3	10	78
55-59	65	1735	61	209	71	474	0.63	11	9.8	0.9	1.6	11	85
60-64	68	1708	60	205	71	498	0.61	10	8.6	0.8	1.5	11	84
65-69	72	1751	61	211	73	491	0.65	11	8.1	0.9	1.4	11	81
70-74	55	1577	59	190	64	444	0.61	10	7.8	0.9	1.3	11	76
75-79	33	1504	53	185	61	406	0.68	9	5.4	0.9	1.4	9	60
80 +	18	1417	45	183	57	349	0.46	9	7.0	1.0	1.2	10	79

*Values are for Utah subjects only.

13-15) and those in the other states were not as consistent as those shown for the boys.

In the 16- and 17-year-old groups, the dietary pattern was similar to that of the 13- to 15-year-olds with low ascorbic acid values (40 to 86 mg. per day). The subjects of both sexes in this age group from Colorado and the Spanish American groups in New Mexico had the lowest ingestion of calories, protein, fat, calcium, and riboflavin of all the subject groups.

Adolescent boys in the several western states had dietary intakes that tended to be similar to the intakes of adolescent boys in the northeastern states (Tucker **et al.,** 1952). Intakes of most nutrients were also similar for the girls (ages 16-17 or 16-20) in the two areas. Protein and ascorbic acid intakes for these girls in several of the western states were lower than those in the northeastern states. The intakes of the 13- to 15-year-old girls showed greater differences between the two areas. The western girls (ages 13-15) consumed somewhat less calories, thiamine, and ascorbic acid than their counterparts in the northeastern states. Protein, calcium, and riboflavin values were similar to those of Maine and Rhode Island but slightly lower than those of New York for the same age.

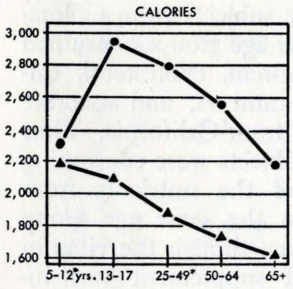
Older men and women: The men and women in the older age groups who were less than 65 years of age consumed somewhat more calories, protein, carbohydrate, fat, cholesterol, iron, and niacin than did those who were more than 65 years of age (table 2). The average intakes of calcium and iron for the various age groups of females, and of ascorbic acid in the Colorado subjects of both sexes, were low in most instances. Daily calcium intake of the females ranged from 0.4 to 0.7 gm. The subjects from Colorado in these older age groups consumed less calories, protein, cholesterol, calcium, iron, vitamin A, and ascorbic acid than those from California. Thus the Colorado subjects were consuming less of some of the nutrients from their diets than the same age group in California even though the vitamin and/or mineral supplement was included for one to three subjects in certain age groups (see table 2).

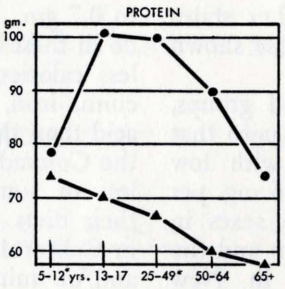
The caloric intake of a small group of healthy Iowa women (Ohlson **et al.,** 1948) during a seven to ten day period was greater for each decade than the caloric intake of the women in the corresponding decade from California or Colorado.

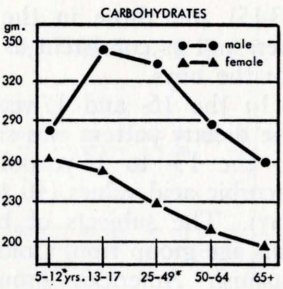
The males of all age groups had, on the average, higher intakes of each nutrient than the females. This was true for the individual states and for the region (table 3).

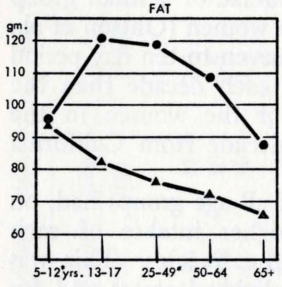
Combined mean intakes: Combined average intakes of the various nutrients of the two groups (ages 13-15, 16-17) of either adolescent boys or girls were similar (table 3). After 50 years of age the combined mean intakes of all the nutrients by both sexes, with the exceptions of vitamin A and ascorbic acid, decreased as compared to the adolescent's intake. It should be pointed out that the higher values obtained in California probably influenced the combined averages for the men and women 50 years of age or older beacuse of the greater number of subjects studied in California.

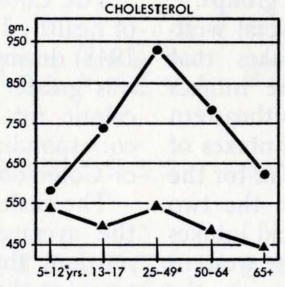
The effect of age on nutrient intake is more easily seen in figure 1. The shape of the curves for each nutrient by age groups followed a similar pattern except for vitamin A and ascorbic acid. For these two nutrients the intake did not vary consistently with

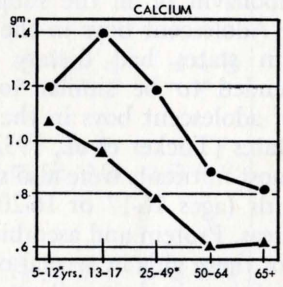


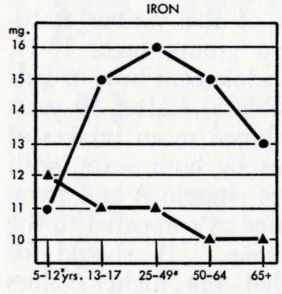


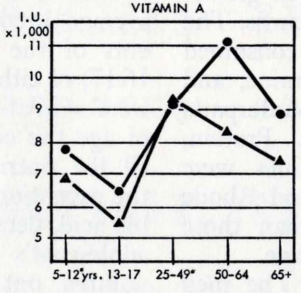


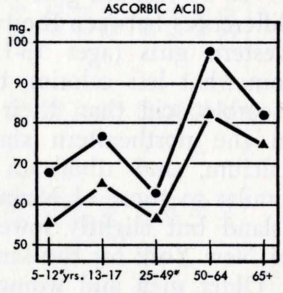


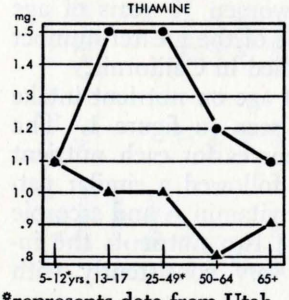


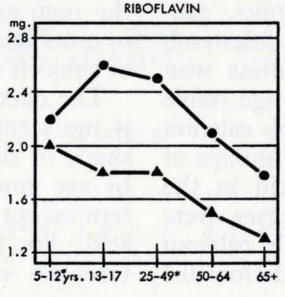


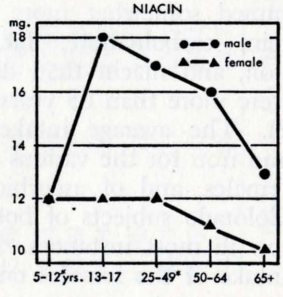












*represents data from Utah

age. For the other nutrients the males in the age groups 13 to 17 or 25 to 49 years consumed the most with the consumption gradually decreasing for the two older groups. The curves for the females showed a gradual decrease for each older age group. Most nutrients showed large differences between intakes by sex at all ages, except for the 5- to 12-year-old group. Vitamin A and ascorbic acid intakes were quite similar for either sex.

The sources of several nutrients, that is, whether of animal or vegetable origin, were also of interest. The fat, protein, and vitamin A intakes from animal and from vegetable sources were calculated for all subjects in this study except for the New Mexico group. Two thirds of the fat and protein intake came from animal sources for the adolescent boys and girls and the older women. The older men also obtained two thirds of their protein from animal sources as well as most of their fat intake, 71 to 75 percent. Animal products accounted for three fourths of the fat and protein intake of the younger Utah children (ages 5-12).

The intakes of vitamin A from animal or vegetable products were more nearly equal than for the other two nutrients. The girls and women in this study obtained slightly less of their vitamin A from animal sources than from vegetable sources (38 to 48 percent from animal sources vs. 52 to 62 from vegetable sources). For the boys and men, except those in the 70 to 79 age group, the reverse was true. An equal or slightly greater amount of vitamin A came from animal products (50 to 60 percent) than from vegetable products.

Distribution of Nutrient Intakes By Age and Sex

The distribution of the subjects for the various age groups according to individual intake of calories and 11 nutrients is shown in figures 2 and 3. These cumulative frequency curves indicate that many individuals were not well fed even though many of the averages showed adequate intakes.

One curve is used in these figures to show the distribution of the 13- to 17-year-old subjects, as curves for the 13- to 15- and 16- to 17-year-olds when plotted separately, were almost identical. The greater intake of calories, protein, fat, iron, and niacin by the adolescent males and those from 25 to 64 years of age as compared to older or younger males is shown in these figures. The consumption of calcium, thiamine, and riboflavin by the men in the 50 to 64 age group paralleled that of the older men (65+ years) and boys (5-12 years), that is, their intake was less than that of the adolescents. When compared to older females, adolescent or younger females had a greater ingestion of the nutrients with the exception of iron, vitamin A, and ascorbic acid.

A line dividing the subjects at the 50 percent mark was drawn on each figure. Most of the groups had a low intake of ascorbic acid. Half of the males under 18 years of age were consuming 60 mg. or less of ascorbic acid, daily, while for the lower half of the females of the same age the value was

Fig. 1. Combined mean daily calorie and nutrient intake of subjects by sex and age group

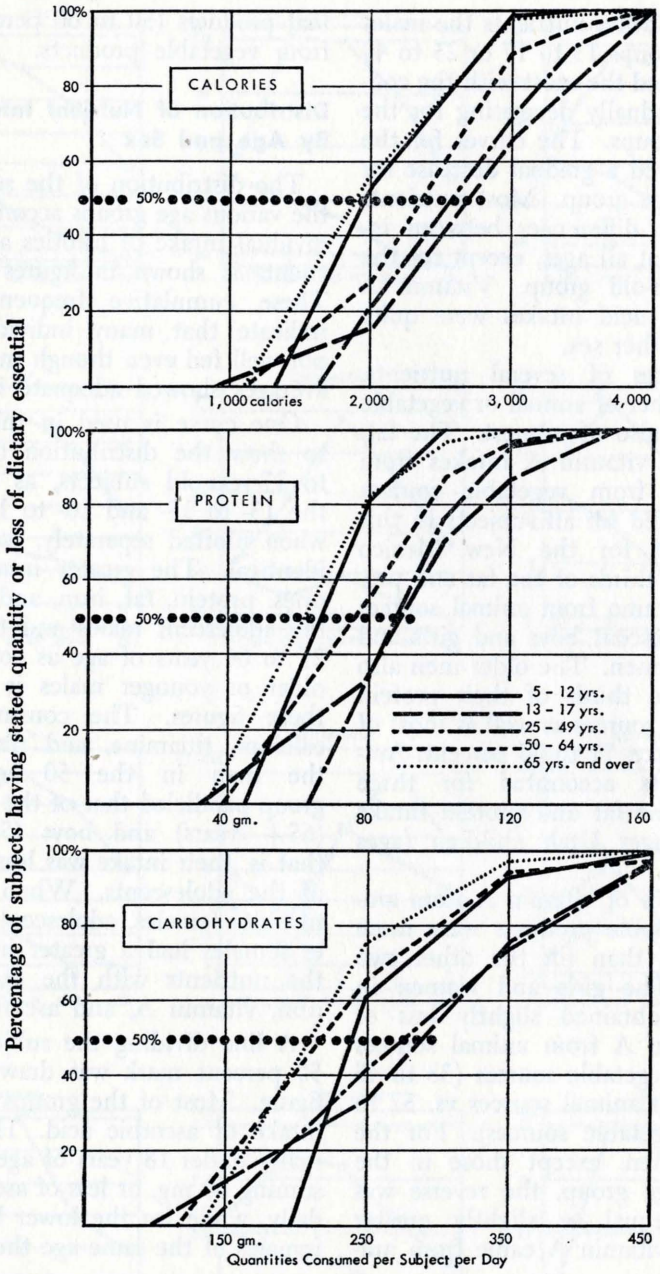


Fig. 2. Distribution of diets of male subjects by calorie and nutrient content

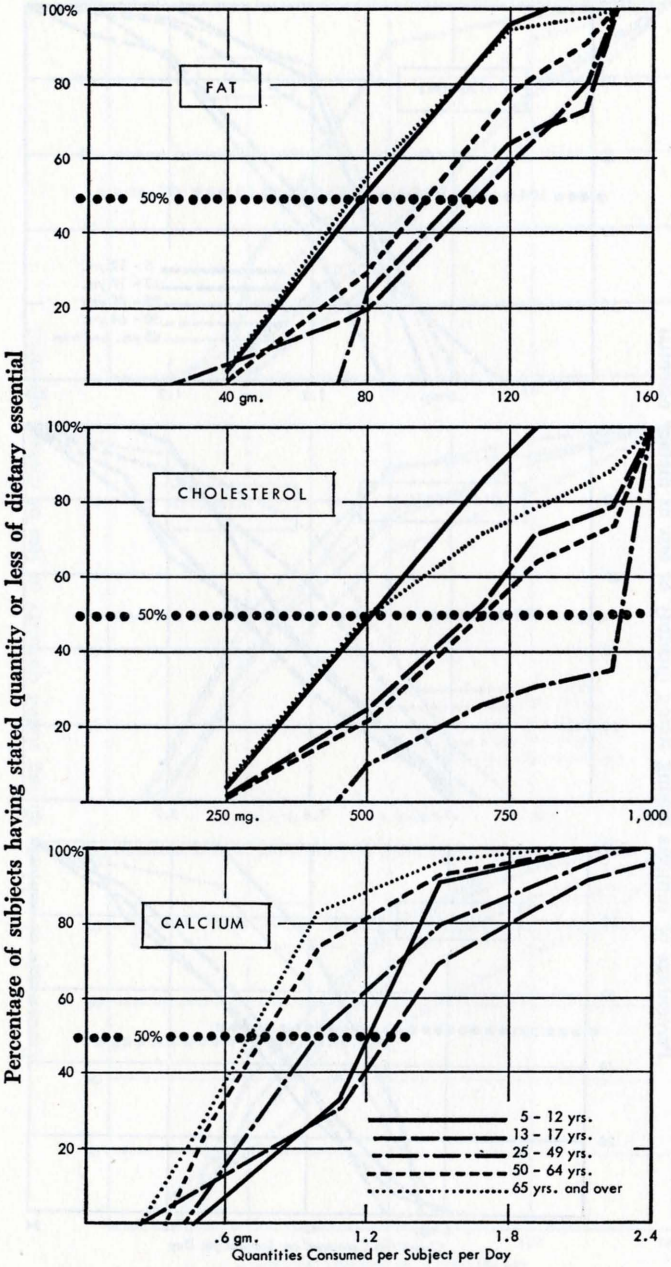
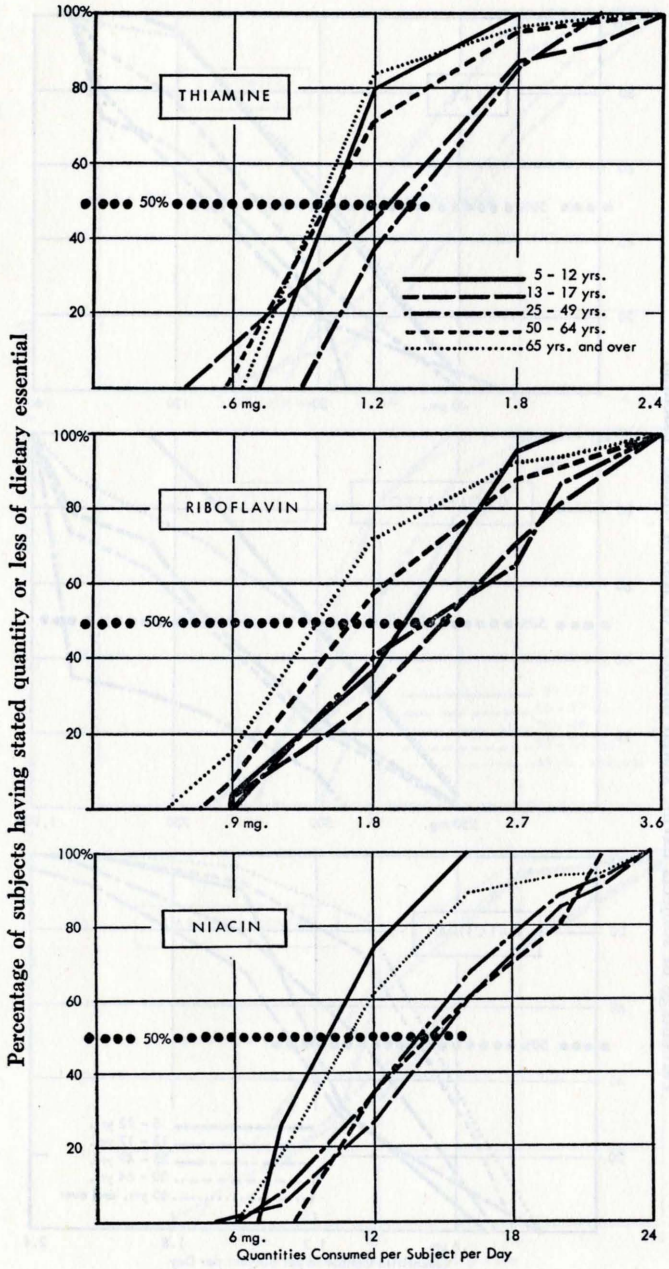


Fig. 2. Continued



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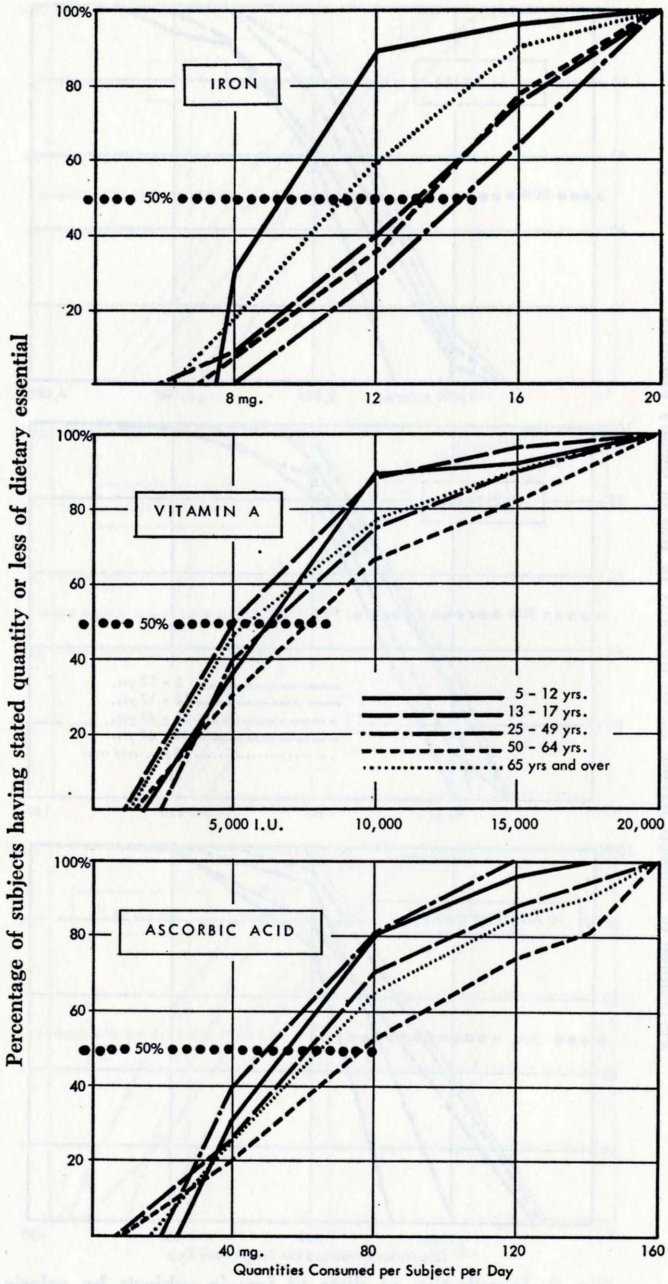

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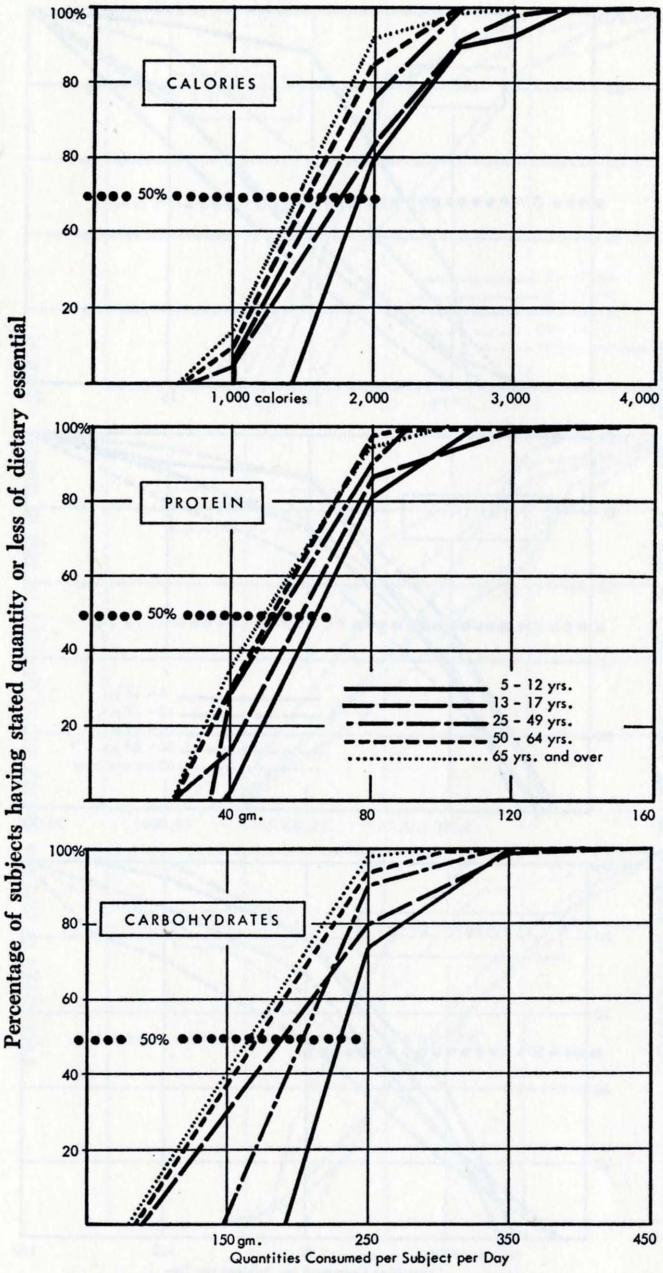
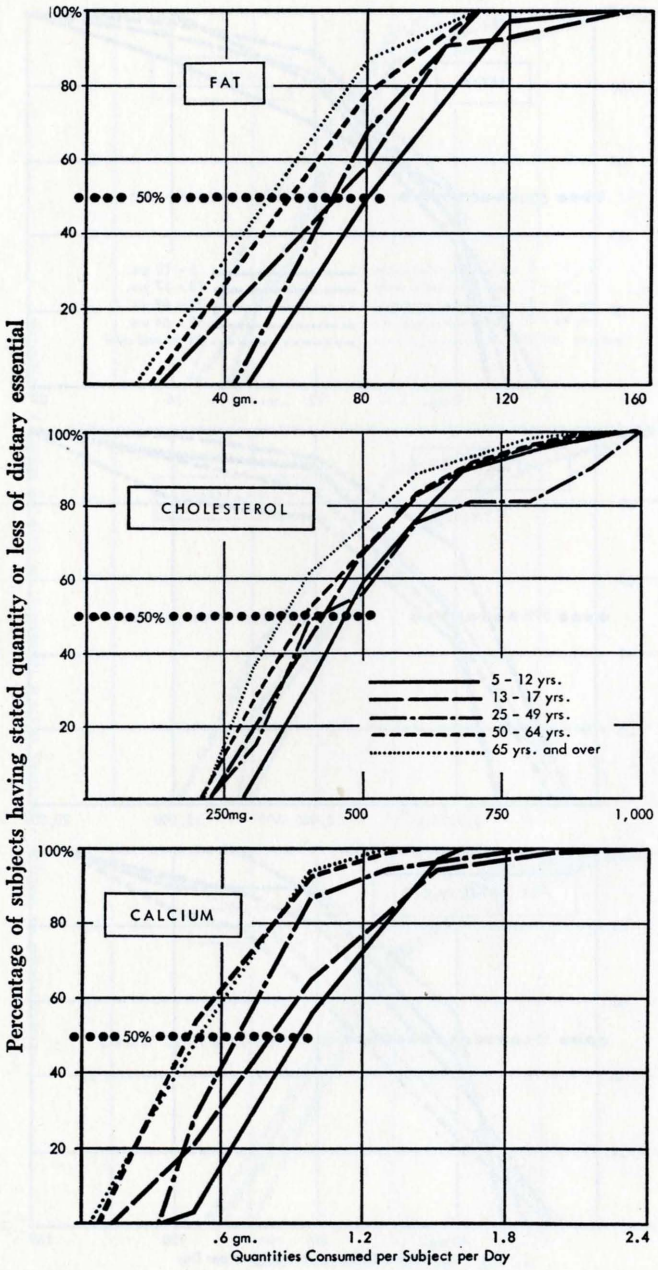


Fig. 3. Distribution of diets of female subjects by calorie and nutrient content



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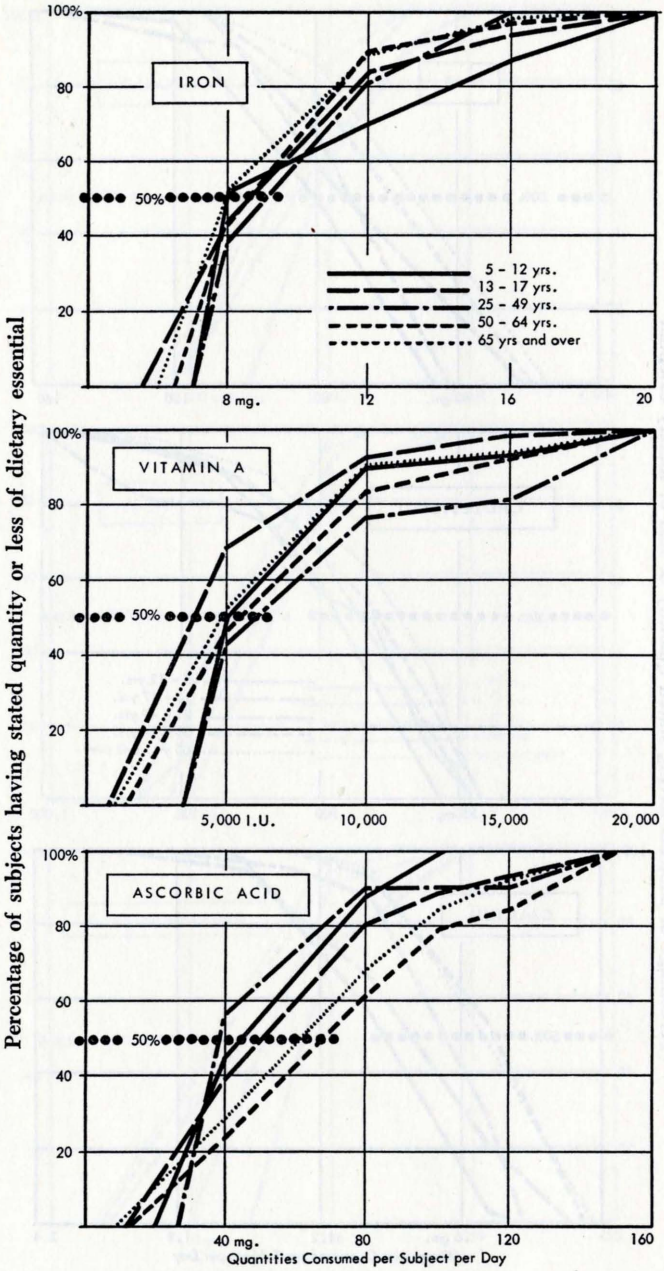

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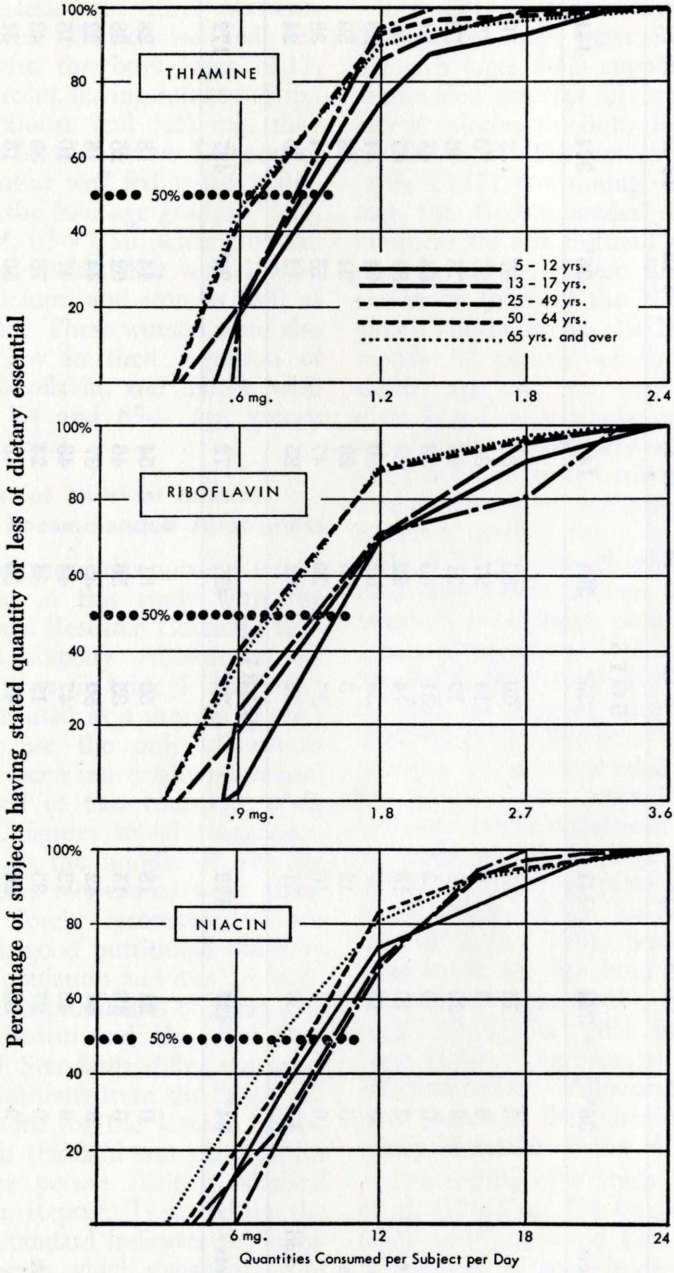

Fig. 3. Continued

Table 4. Percentage of children and adolescents by age and sex groups whose diets furnished various levels of the National Research Council Recommended Allowances

	66% or less			67% - 100%			100% or above		
Age	**5-12**	**13-15**	**16-17**	**5-12**	**13-15**	**16-17**	**5-12**	**13-15**	**16-17**
				BOYS					
No. subjects	**36***	**394**	**141**	**36***	**394**	**141**	**36***	**394**	**141**
Nutrients									
Calories	3	14	25	30	53	65	67	33	10
Protein	0	4	9	14	27	34	86	70	57
Calcium	6	23	19	19	31	28	75	46	53
Iron	6	9	3	31	43	33	64	48	64
Vitamin A	3	13	18	14	22	23	83	65	59
Thiamine	0	15	27	36	52	50	64	34	23
Riboflavin	3	6	12	3	25	29	94	68	59
Niacin	0	7	16	25	39	47	75	54	38
Ascorbic acid	17	38	51	42	32	25	42	30	24
				GIRLS					
No. subjects	**34***	**427**	**172**	**34***	**427**	**172**	**34***	**427**	**172**
Nutrients									
Calories	0	21	18	56	61	54	44	18	28
Protein	3	19	15	35	56	46	62	25	38
Calcium	6	46	42	50	35	37	44	18	22
Iron	6	46	42	47	44	43	47	10	15
Vitamin A	9	27	33	15	34	24	76	39	43
Thiamine	9	32	20	41	50	49	50	18	31
Riboflavin	3	25	26	15	40	30	82	35	44
Niacin	6	15	9	35	47	38	59	38	52
Ascorbic acid	38	44	44	26	28	28	35	27	27

*Values are for Utah subjects only.

50 mg. or less. For other nutrients the males were relatively well fed. Exceptions were the boys (ages 13-17) with 50 percent having intakes of under 2750 calories and 1.25 mg. thiamine. The females above 12 years of age were not as well fed as the males. In each of the four age groups (13-17, 25-49, 50-64, 65+) 50 percent of the females had intakes that were low in calories, calcium, and iron as well as ascorbic acid. These women were also somewhat low in their ingestion of thiamine, riboflavin, and niacin, with the 50 to 64 and 65+ age groups being the lowest.

Comparison of Nutrient Intakes With NRC Recommended Allowances

A comparison of the nutrient intake for children in this study with the 1953 National Research Council's Recommended Dietary Allowances for children is given in table 4. The NRC figures were used as a measuring stick since they are the only allowances which have been universally publicized or circulated in this country. With these NRC figures actual comparison is made with the middle of any age group. These allowances were established as levels recommended for maintaining good nutritional status in the total population and may be higher than the requirements of some people. The British and Canadian Recommended Standards differ markedly for some nutrients from the NRC recommendations for the United States. The British standard was planned for the average person (British Medical Association Report, 1950) while the Canadian standard indicates the minimum "beneath which maintenance of health in people cannot be assumed" (Canadian Council on Nutrition, 1950).

The diets of approximately 60 percent of the boys (ages 5-17) and of the girls (ages 5-12) supplied the recommended amount of each nutrient except calories, calcium, thiamine, and ascorbic acid. The percentage of girls (ages 13-17) consuming diets which met the Recommended Dietary Allowances for any nutrient was 52 percent or below. These findings were similar to those of the Northeast Region (Tucker **et al.**, 1952). Approximately 60 percent of their boys of similar age and sex were consuming diets, based on seven-day records, that supplied the recommended amount of every nutrient except calories, ascorbic acid and for some age groups calcium. However, half of the girls (ages 13-15 and 16-20) in the Northeast Region used diets which did not meet the allowances for calories, protein, calcium, iron, and thiamine. Nutritionists used the NRC Recommended Allowances of 1948 for judging adequacy of the dietaries in the Northeast study. Slight changes in recommended allowances for children were made in the 1953 revision. Small reductions were made for girls in calories (ages 10-12 and 13-15), in calcium (ages 16-20), and in iron (ages 10-12); for boys in vitamin A (ages 16-20). Small increases were made for the boys in thiamine and niacin (ages 10-17), in riboflavin (ages 13-15); for girls in riboflavin (ages 16-20). The changes in the 1953 Recommended Allowances should have increased the percentage of adequacy of intake of the Western girls.

The results of a study by Storvick **et al.** (1951) on 739 Oregon children (ages 14-16) revealed that more than 60 percent of the children (data for boys and girls combined) had diets which were adequate in all of the nutrients except iron and ascorbic acid.

Table 5. Percentage of adults by age and sex groups whose diets furnished various levels of the National Research Council Recommended Allowances

	66% or less					67% - 99%					100% or above				
Age	25-49	50-59	60-69	70-79	80-over	25-49	50-59	60-69	70-79	80-over	25-49	50-59	60-69	70-79	80-over
						MEN									
No. subjects	20*	97	102	73	22	20*	97	102	73	22	20*	97	102	73	22
Nutrients															
Calories	15	9	10	11	14	45	55	54	67	54	40	36	36	22	32
Protein	0	0	2	3	0	5	6	19	27	45	95	94	79	70	54
Calcium	5	18	17	23	18	25	33	31	27	32	70	48	52	49	50
Iron	0	2	2	5	4	20	15	24	34	41	80	82	74	60	54
Vitamin A	5	7	10	11	18	10	12	20	15	18	85	80	70	74	64
Thiamine	10	14	10	8	4	45	62	52	52	54	45	24	38	40	41
Riboflavin	0	3	7	11	9	15	25	26	29	32	85	72	67	60	59
Niacin	5	5	10	11	4	35	27	25	25	32	60	68	65	64	64
Ascorbic acid	40	23	22	26	18	35	18	21	33	41	25	59	57	41	41
						WOMEN									
No. subjects	21*	124	140	88	18	21*	124	140	88	18	21*	124	140	88	18
Nutrients															
Calories	14	12	11	14	17	57	58	52	59	44	29	30	36	27	39
Protein	5	4	5	7	17	24	40	34	43	61	71	56	61	50	22
Calcium	19	46	40	31	50	43	35	35	45	44	38	19	25	24	6
Iron	14	15	13	34	28	29	60	56	45	61	57	25	31	20	11
Vitamin A	19	20	15	23	28	19	16	20	19	22	62	64	65	58	50
Thiamine	19	24	16	20	22	52	52	52	49	28	29	24	31	31	50
Riboflavin	0	17	17	15	28	24	40	38	44	39	76	43	44	41	33
Niacin	10	10	7	16	11	33	27	30	27	33	57	64	63	57	56
Ascorbic acid	43	27	16	32	33	43	17	24	26	17	14	56	59	42	50

*Values are for Utah subjects only.

Storvick **et al.** based their diet evaluations on information obtained by a combination of a 24-hour food intake and dietary history check list. They used the 1948 Recommended Allowances to evaluate the dietaries. Even though the Oregon study is not based on seven-day diet records, it is of interest that dietary patterns are similar to those of the other western states.

More of the children in this study were consuming inadequate amounts of ascorbic acid than of any other nutrient, although consumption of calcium and iron by the adolescent girls was equally low. Thirty-eight to 51 percent of the adolescents had intakes of less than two thirds of the Recommended Allowances of ascorbic acid. Many more of the adolescent subjects had poorer diets than the Utah children under 13 years of age. Differences were not great in the percentages of subjects of the same sex for the two age groups (13-15 and 16-17) who were consuming 66 percent or less of the Recommended Allowances of the various nutrients. However, there were many more girls of these two age groups with low intakes than boys. This finding, that the dietaries of the boys were superior in nutritive value to those of the girls, is in agreement with results found by several workers including the studies by Storvick **et al.** and Tucker **et al.**

Differences in iron intake between the boys and girls (ages 13-15 and 16-17) were greater than those found by Storvick **et al.** and Tucker **et al.** Forty-six and 42 percent of the girls in the 13- to 15- and 16- to 17-year groups, respectively, in the Western Region received less than two thirds of the Recommended Allowances in comparison with 8 and 22 percent of girls of similar age in the Northeast Region and 26 to 38 percent of girls (ages 14-16) in Oregon.

The dietary intakes not meeting the Recommended Allowances which were found most frequently in the present study were ascorbic acid, calcium, and iron. In comparison, low intakes most prevalent in the Northeast Region were ascorbic acid, vitamin A, calcium, and riboflavin. Findings by Velat **et al.** (1951) also indicated that ascorbic acid, calcium, and vitamin A are likely to be low in the diets of school children.

A somewhat similar but less striking picture is shown by the older subjects in table 5. From 31 to 50 percent of the women more than 50 years of age were obtaining 66 percent or less calcium than is recommended. Ascorbic acid was the other nutrient most often deficient in the diets of the females and was also somewhat low in the diets of the men. Increase in age by decades did not influence the number of men in the 66 percent or less group. The number of women 80 years or older who were this low in their intake of protein and riboflavin was greater than for those from 25 to 79 years of age. However, this was a small group, only 18 women.

Although the average intake of most nutrients was greater for the adolescent subjects of either sex than for those more than 50 years old of the same sex, the percentage of older subjects not consuming 67 percent of the Recommended Allowances was considerably less than for the younger subjects. Hence, the mean intakes can give a false picture for any age group.

Subjects having less than two thirds of Recommended Allowances: The percentage of subjects in each state, by age and sex groups, with a nutrient intake less than two thirds of the Rec-

Table 6. Comparison by state of the percent of subjects with a nutrient intake less than two thirds of the National Research Council Recommended Allowances

Age group and state	Calories	Protein	Calcium	Iron	Vitamin A	Thiamine	Ribo-flavin	Niacin	Ascorbic acid
				MALES					
5-12									
Utah	3	0	6	6	3	0	3	0	17
13-15									
Colorado	28	5	43	18	22	31	14	14	65
Idaho	9	4	7	2	9	4	2	4	30
Montana	6	1	16	9	9	11	2	3	26
New Mexico									
Anglo American	21	0	14	7	28	14	0	14	36
Spanish American	41	19	62	9	38	41	25	25	47
Utah	14	0	28	19	5	19	5	5	67
Washington	5	1	9	3	6	3	2	3	26
16-17									
Colorado	53	20	40	13	27	53	33	40	80
Idaho	21	9	9	....	19	24	7	9	40
New Mexico									
Anglo American	33	8	25	17	25	42	17	33	50
Spanish American	67	25	67	0	33	42	25	50	42
Utah	0	0	0	0	0	0	0	0	50
Washington	3	0	14	0	3	14	7	0	66
25-49									
Utah	15	0	5	0	5	10	0	5	40
50-59									
California	9	0	14	1	4	13	2	6	19
Colorado	11	0	39	6	22	22	6	0	39
60-69									
California	6	3	14	0	6	10	7	10	21
Colorado	20	0	23	7	20	10	7	10	27
70-79									
California	4	2	18	2	8	6	4	8	16
Colorado	25	4	33	12	17	12	25	17	46
80 and over									
California	13	0	13	7	7	7	7	7	13
Colorado	14	0	29	0	43	0	14	0	29

Table 6. (continued)

Age group and state	Calories	Protein	Calcium	Iron	Vitamin A	Thiamine	Ribo-flavin	Niacin	Ascorbic acid
				FEMALES					
5-12									
Utah	0	3	6	6	9	9	3	6	38
13-15									
Colorado	32	28	67	52	30	49	44	22	60
Idaho	17	11	33	34	30	28	8	8	34
Montana	20	21	51	62	23	32	25	15	44
New Mexico									
Anglo American	11	11	39	22	33	17	17	11	33
Spanish American	33	33	73	21	39	27	30	12	42
Utah	20	20	28	48	36	20	24	20	52
Washington	15	12	33	42	29	29	21	15	39
16-17									
Colorado	32	26	63	63	37	47	47	16	74
Idaho	15	12	31	45	29	10	21	4	32
New Mexico									
Anglo American	10	10	42	21	53	16	21	10	42
Spanish American	25	25	64	36	39	39	36	14	46
Utah	10	10	10	30	10	10	10	20	80
Washington	19	6	50	44	31	12	25	12	44
25-49									
Utah	14	5	19	14	19	19	10	10	43
50-59									
California	10	3	46	13	18	25	17	8	23
Colorado	17	7	45	24	28	21	17	14	41
60-69									
California	5	2	34	6	9	10	13	3	12
Colorado	32	15	59	35	32	35	29	21	29
70-79									
California	7	3	20	25	15	12	8	8	26
Colorado	30	15	56	56	41	41	30	33	44
80 and over									
California	17	8	42	25	33	17	25	8	17
Colorado	17	33	67	33	17	33	33	17	67

ommended Allowances is presented in table 6. One third or more of the 13- to 15-year-old boys from Colorado were this low in their intake of calcium, thiamine, and ascorbic acid while the Spanish American boys from New Mexico were this low in calories and vitamin A in addition to the above mentioned three nutrients. The boys in this age groups in other states had better diets except for ascorbic acid. A similar pattern of low intakes was shown by the boys (ages 16 and 17) except that in many cases the percentage of subjects low in a nutrient was greater than for the 13- to 15-year-olds. In male groups more than 50 years of age, only the 50- to 59- and 70- to 79-year-olds had one third or more with diets low in calcium and ascorbic acid and for those 80 and over, in vitamin A.

The girls showed a similar pattern although many more of the girls 13 to 17 years old were ingesting 66 percent or less than the Recommended Allowances of most of the nutrients than were the boys of the same age. Colorado girls and Spanish American girls from New Mexico had poorer diets than were consumed in the other states, that is, with one third or more low in the nutrients. The few exceptions for each were as follows: Protein and niacin in Colorado, and iron, thiamine, and niacin in New Mexico. In the two adolescent groups (ages 13-15 and 16-17) the percentages of subjects with low nutrient intakes were similar.

For the older women, calcium was the nutrient most often found to be deficient in each age group whether from California or Colorado. In most instances, the number of Colorado women low in individual nutrient intakes was considerably greater than among the California subjects. Age after 50 did not seem consistently to affect the percentage of subjects with low nutrient intakes. In fact, individual diets of the women more than 25 years of age were better than those of the adolescent girls since the latter group had many more subjects consuming less than two thirds of the Recommended Allowances.

Weight Status

Deviations of the weights of the children from average weights for height and age (Baldwin-Wood Tables, 1949) are presented in figure 4. One third of the children were within the normal weight range. In the groups of adolescent girls, one third were 5 percent or more underweight while another third were 5 percent or more overweight. Approximately one fifth of these girls were underweight or overweight by 10 percent or more. The adolescent boys had one third more underweight than overweight at either the 5 or 10 percent deviation level.

Weight may be an indication of the adequacy of caloric intake. In the combined adolescent groups of boys or girls, mean caloric intakes were below recommendations (9 to 20 percent below). From 14 to 25 percent of these children were consuming less than two thirds of the calories recommended by the National Research Council.

Under and overweight in the aging group: In the adult groups, 9 to 17 percent of the subjects were getting less than two thirds of the calories recommended in the NRC allowances. Their weight status is shown in figure 5. Weights were compared to values in the Metropolitan Life Insurance

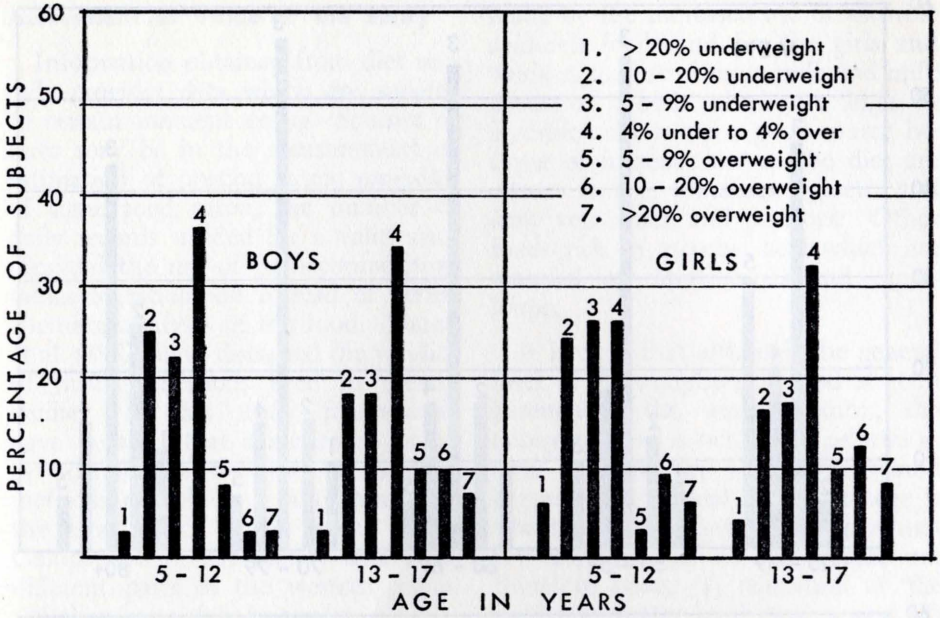

Fig. 4. Percent weight deviation for children according to sex and age group

Tables (Metropolitan Life Insurance Co., 1942, 1943).

After 50 years of age there was a steady increase in the percentage of both men and women who were extremely underweight (more than 20 percent underweight), which was considerably more marked in the women. The percentage of men who were moderately underweight increased steadily after 50 years of age, but the percentage of women in this grouping remained the same at 16 or 17 percent. At all ages about half of both men and women, 42 to 57 percent, were in the nearly normal weight group, −10 to +10 percent under or over weight. Both men and women over 50 years old showed about the same percentage, 13 to 17, in the moderately overweight group. The exception was in women over 80 years, of whom only 5 percent were overweight. The proportion of both men and women who were extremely overweight declined with age from 10 percent for men and 17 for women to 7 for men and none for women in the oldest age group.

Thus a fairly equal number of both men and women over 50 years were under and over weight in about the same degree. The proportion of underweight women over 70 years of age was greater than of men of that age.

There appears to be little evidence of excessive adiposity in this aging population since only one in 4 or 5 men over 50 years and one in 3 or 4 women 50 to 79 years old and almost none over 80 were 10 percent or more over the normal weight. And at all ages over 60 an equal or greater number of both men and women were to the same degree underweight.

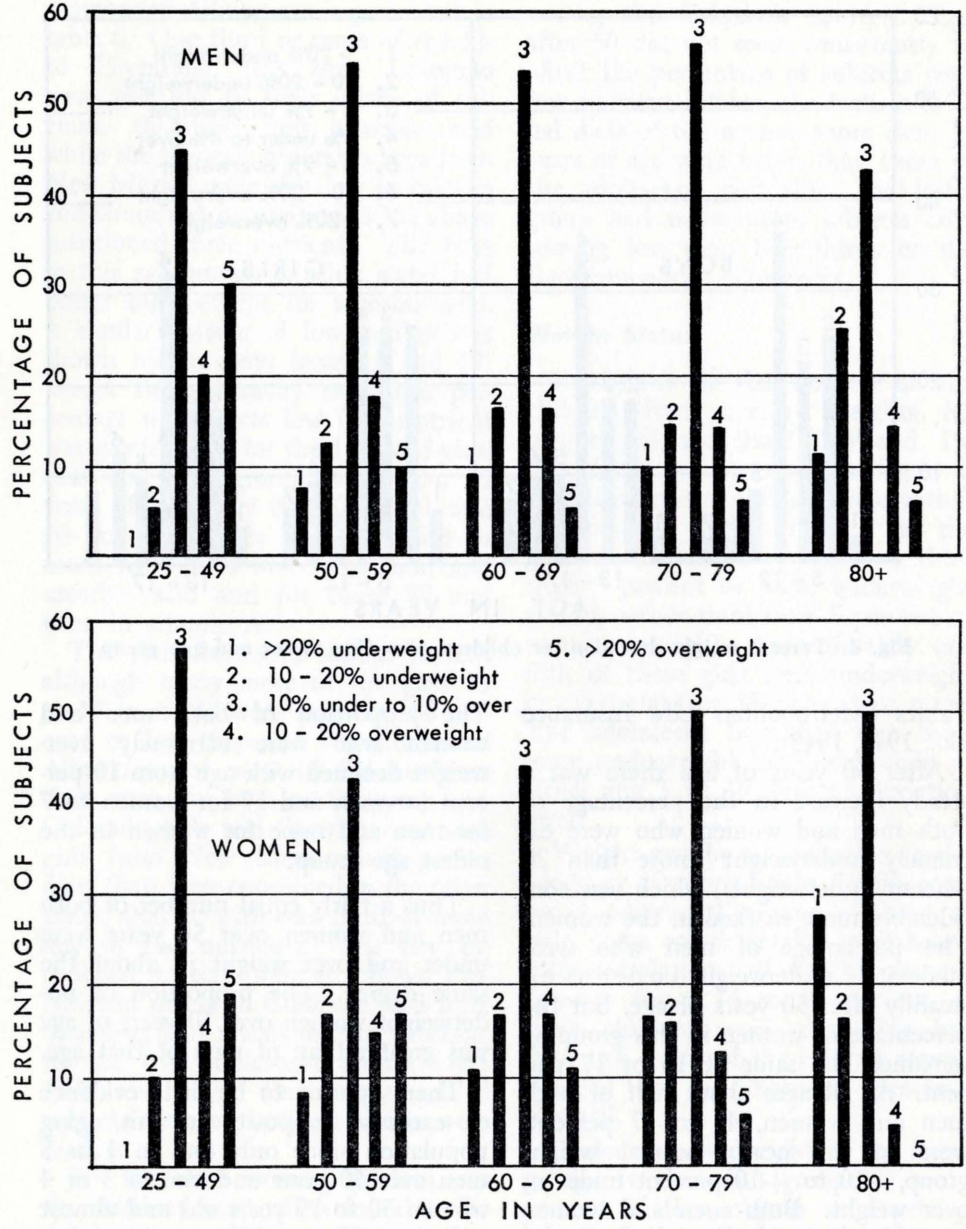

Fig. 5. Percent weight deviation for adults according to sex and age group

Assessment of Value of the Study

Information obtained from diet records provides data which are subject to certain inherent errors. Sources of error may be in the measurement or estimation of portion eaten, omission of some food eaten, the number of daily records needed for a valid sample, and the use of food composition tables in tabulation instead of actual chemical analyses of the food. Young **et al.** (1952) have discussed the validity of various methods used in dietary studies. In this study, inaccuracies have been kept at a minimum as far as possible by the use of uniform methods of collecting and tabulating the data in each of the several states. Comparison of the dietary data from different parts of the western region can therefore safely be made.

Improvement of dietary practices for the adolescents and adults over 50 years of age in the Western Region as indicated by this study could be made by the increased use of ascorbic acid-rich foods and for the girls and women, the use of more milk and milk products. Foods which are high in ascorbic acid or are a good source because of frequent use in the diet are citrus fruits, tomatoes, green and leafy vegetables, and potatoes. Other foods rich in ascorbic acid which are seasonal are strawberries and canteloupe.

It is clear that although the general level of consumption of food is good throughout the western states, the choice of food is not always as wise as even present day knowledge would suggest. Yet present day knowledge is admittedly inadequate. Two avenues for improvement in the future are therefore open, (1) education of the public to better food choices and (2) research in food chemistry and the mechanisms of nutrition. Both of these aims should benefit agriculture as well as the public health.

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COOPERATIVE NUTRITION PROJECT

FOOD RECORD A

We would like a record of what you eat for seven days. Space for recording this information is provided on the following pages of this form. Please read carefully the instructions below before you start to list the foods you have eaten.

Referring to the blank record sheets you will notice there is space to put down anything you eat any time during the day or night. Keep the record as you go along because it is much easier for you. If you would sit down in the evening trying to remember everything you had eaten that day, it would be quite difficult to remember all the foods, and impossible to remember the amounts of each food you had eaten.

1. WRITE DOWN EVERYTHING THAT YOU PUT IN YOUR MOUTH AND SWALLOW.

   If you miss a meal write "nothing" in the space for that meal. DO NOT eat any differently than usual. Just remember to write it all down.

2. BE SURE TO WRITE DOWN THE KIND OF FOOD YOU EAT.

   If you eat cereal write whether it is oatmeal, shredded wheat, cornflakes, etc. Specify the kind for each food, such as:

   Bread.....whole wheat, white, rye; also store or homemade.
   Meat.....roast beef, hamburger, veal steak, pork chops, etc.
   Salad.....head lettuce, canned fruit, tuna, etc.
   Milk.....pasteurized, raw, homogenized, canned; also whole or skim.
   Soup.....cream of tomato, chicken noodle, vegetable, etc.

3. TELL HOW EACH FOOD IS COOKED.

   If you eat an egg write whether it is fried or boiled, etc.
   For meats give such information as "broiled" lamb chop, "breaded" pork chop, "fried" chicken.

   For fruits and vegetables state whether they are fresh, frozen, or canned.

   For vegetables tell whether they are creamed, buttered, mashed, baked, etc.

   If food is not cooked, but eaten raw, write raw after it.

4. WHEN YOU EAT TWO OR MORE FOODS COMBINED WRITE DOWN EACH FOOD INCLUDED:

Raw vegetable salad:	Lettuce	1 leaf
	tomato	1 slice
	cucumber	2 slices
	French dressing	1 tablespoon
Cheese sandwich:	bread, white	2 slices
	Swiss cheese	1 slice
	lettuce	1 leaf
	mayonnaise	2 teaspoons

5. WHEN YOU EAT OTHER COMBINATION FOODS, SUCH AS CASSEROLE DISHES, SOUPS, STEWS, PUDDINGS, CHOWDERS, ETC., WRITE DOWN WHAT IS CONTAINED IN THE RECIPE. Since there are many different kinds of puddings, soups, etc., it is important to tell of what your combination consists.

6. WRITE DOWN THE EXACT AMOUNT OF EACH FOOD YOU EAT.
You will use a **standard measuring cup, LEVEL teaspoon and tablespoon, and a ruler** to measure your food. Tell how many level teaspoons (t), tablespoons (T) you eat, or whether you eat ½ or 1/3 or 1 cup, etc. Tell how many slices or pieces such as pineapple, canned, 1 slice, or apple, raw, 1 whole.

   DO NOT write down "glasses," "bowls," or "plates" for such foods as milk, soup, and vegetables. Since these utensils can be of any size, large or small, measure with the standard measuring cup or level teaspoons or tablespoons what goes into the glass or bowl or on the plate. By level it means to scrape off the excess with the edge of a knife or spatula because a "spoon" could be heaping or scant and it is important to know the exact amount.

   The ruler will be needed to measure foods not accountable in measuring cups, teaspoons, and tablespoons. Use it for foods of which you determine the size, such as, cake, meat, pancakes, pie, etc. For round shapes (rolls, pancakes, meat patties, cup cakes, etc.) give diameter and thickness. For other give 3 dimensions—length, width, and thickness.

   Examples: Pancake, 1, 6″ diameter, ⅜″ thick
   Choc. cake, iced, 1 piece, 2″ x 2″ x 1″
   Baked ham, 1 slice, 4″ x 3″ x ¼″
   Pie—give measurements in inches, or tell whether it is a 1/6th or ⅛ etc. of a 8″, 9″, or 10″ pie (diameter of the whole pie)

7. BE SURE TO WRITE DOWN THE FOODS YOU ADD TO OTHER FOODS, SUCH AS THE SUGAR, CREAM AND BUTTER YOU USE.

   If you put sugar or cream on cereal, fruit, in tea or coffee, be sure to say how much.

   If you put butter on vegetables as well as bread, be sure to list how much. If you use jelly, syrup, etc., be sure to list it. Remember to measure in **level** teaspoons or tablespoons; then if you want more, take it, just remembering to measure that amount too.

8. List brand and number of vitamin pills you took.

9. WRITE ON BACK OF RECORD SHEET ANY FOOD SERVED THE FAMILY WHICH YOU DID NOT EAT TODAY.

10. After you write the record of each meal check it carefully with these instructions. If you have any questions do not hesitate to call the office of the Western Region Cooperative Nutrition Project .....

    The nutritionist will gladly answer any questions you may have.

SAMPLE RECORDINGS:

FOOD	KIND AND STATE	AMOUNT
cereal	oatmeal	¾ cup
sugar	.....	2 teaspoons
cream	pasteurized	¼ cup
pancake	white enriched flour	1, 6″ diam. ½″ thick
egg	fried	1
meat	baked ham	4″ x 3″ x ¼″
potatoes	mashed	¾ cup
peas	canned	½ cup
butter on peas	.....	½ teaspoon
milk	whole, pasteurized	1 cup
cake	choc., iced	2″ x 2″ x 1″

FOOD RECORD SHEET

NAME ..... No.....

ADDRESS..... DATE..... DAY OF WEEK.....

FOOD	KIND & STATE	AMOUNT
BREAKFAST		
BETWEEN MEAL		
NOON MEAL		
BETWEEN MEAL		
EVENING MEAL		
AFTER EVENING MEAL		

CHECK YOUR MEAL RECORD CAREFULLY WITH INSTRUCTIONS

COOPERATIVE NUTRITION PROJECT

FOOD RECORD B

Name..... Registration no.....

MEALS PER DAY:
Breakfast..... Luncheon..... Dinner..... Other.....
Explanation .....

MEALS PREPARED AT HOME:
Breakfast..... Luncheon..... Dinner..... Other.....
Explanation .....

(USED FOR ADULTS)

MEALS PREPARED ELSEWHERE:
Breakfast..... Luncheon..... Dinner..... Other.....
Explanation .....

ARE MEALS: Leisurely..... hurried..... eaten with others..... eaten alone.....
If eaten with others, is there confusion..... or calmness.....
If eaten alone, are meals prepared by participant..... other.....
If prepared by other, specify whom.....

REST BEFORE MEALS: Yes..... No..... REST AFTER MEALS: Yes..... No.....
Which meals? B.....L.....D..... Which meals? B.....L.....D.....

STRENUOUS ACTIVITY: Before meals: Yes.....No..... After meals: Yes.....No.....
Which meals? B.....L.....D..... Which meals? B.....L.....D.....

ALLERGIES: Yes..... No..... SYMPTOMS: Digestive..... Other.....
If yes, to which foods: Milk..... Eggs..... Wheat.....
Others .....
Are these foods usually avoided? Yes..... No.....

HAVE SPECIAL DIETS OR FOOD CUSTOMS BEEN FOLLOWED: Yes..... No.....
Explain .....

(USED FOR ADOLESCENTS AND CHILDREN)

Do you have any discomforts or physical signs which are caused by foods?
Yes..... No..... SYMPTOMS: Digestive..... Other.....
If yes, what foods: Milk..... Eggs..... Wheat..... Others.....
.....Are these foods usually avoided? Yes..... No.....

HAVE SPECIAL OR THERAPEUTIC DIETS EVER BEEN FOLLOWED? Yes.... No....
If yes, for what?..... How long ago?.....

Does participant have any national or traditional food customs? Yes..... No.....
Explanation .....
Special dishes .....

Signature..... Date.....

LAXATIVES USED: Yes..... No..... Kind: Mineral oil..... Other.....

When taken?..... How often taken?.....

How much taken?.....

SUPPLEMENTS USED: Fish liver oil..... Vitamins..... Minerals.....

FOODS ESPECIALLY WELL LIKED.....

FOODS USUALLY AVOIDED.....

DOES PARTICIPANT RAISE ANY OF OWN FOOD? Yes..... No.....

If yes, specify kind.....

DOES PARTICIPANT PRESERVE OWN FOOD? Yes..... No.....

	Can	Freeze	Kinds
Meats	.....	.....	.....
Jelly, jam	.....	.....	.....
Fruits	.....	.....	.....
Vegtables	.....	.....	.....

ENERGY EXPENDITURE ESTIMATE.....PRESENT TIME

Time in bed at night.....hrs. Sleep restful..... difficult.....

Daytime sleep or rest lying down.....hrs.

Description of average day's activities, work and/or recreation time:

.....

.....

.....

.....

.....

.....

ENERGY EXPENDITURE SUMMARY:

	Childhood	Youth	Adult	Present
Very light	.....	.....	.....	.....
Light	.....	.....	.....	.....
Moderate	.....	.....	.....	.....
Severe	.....	.....	.....	.....
Very severe	.....	.....	.....	.....

Age: .....

Approximate weight: .....

Approximate height: .....

DIETARY HISTORY RECORD

CEREAL:

Cooked .....

Prepared .....

Rice .....

Pastes .....

BREAD:

Whole grain..... Enriched.....

Pancakes or waffles..... Other hot breads.....

MILK:

Whole..... Raw..... Past..... Amount per day.....

Skim..... Evap..... How used..... Dried.....

Buttermilk..... Milk shakes.....

CHEESE:

American..... Cottage.....

Other .....

BUTTER:

.....

EGGS:

.....Per week. In custard or other forms.....

ICE CREAM:

.....

DESSERTS:

Cake .....

Cookies .....

Pies .....

Puddings .....

FRUITS:

Citrus, fresh or frozen.....canned.....

Yellow, fresh or frozen ..... canned.....

Yellow, dried .....

Other, fresh or frozen .....

.....

Other, canned .....

.....

Other, dried .....

LEGUMES:

Dried .....

DIETARY HISTORY RECORD

No.....

MEAT:

No. times a week.....

Beef ..... Liver.....

Lamb ..... Poultry.....

Pork ..... Prepared meats.....

Fish .....

NUTS:

Peanuts ..... Peanut butter.....

Other .....

SOUPS:

Clear ..... Cream.....

Homemade ..... Canned.....

SWEETS:

Sugar ..... Candy.....

Syrups ..... Jam, jelly.....

Molasses ..... Honey.....

Soft drinks .....

VEGETABLES:

Potato, white ..... Sweet.....

Tomato, raw ..... Cooked or canned.....

Green leafy, raw .....

Green leafy, cooked .....

Green, non-leafy raw .....

Green, non-leafy cooked ..... Canned.....

Yellow, raw ..... Cooked.....

Yellow, canned .....

Other raw .....

Other cooked .....

Other canned .....

BEVERAGES:

Coffee ..... Tea.....

Ovaltine ..... Water.....

Alcohol .....

MISCELLANEOUS:

Salt, iodized ..... Plain.....