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Evaluation of the Boarding School Diets of Indian Children of the Dakotas and Observations on the Growth and Development of Adolescent Indian Girls

C. Schuck

B. G. Wenberg

M. T. Boedeker

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Indian Children of the Dakotas

- Boarding School Diets
- Growth and Development of Adolescent Girls

College of Home Economics
Agricultural Experiment Station
South Dakota State University, Brookings

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COVER PHOTO — An alert, happy young Sioux. Holy Rosary Mission School, Pine Ridge, S. Dak.

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Evaluation of the Boarding School Diets of Indian Children of the Dakotas and Observations on the Growth and Development of Adolescent Indian Girls

By **Cecilia Schuck, Burness G. Wenberg,** and **Margaret Talcott Boedeker***

INTRODUCTION

Anthropological, sociological, and general health studies among Indian population groups point to importance of additional information about dietary practices and nutritional status. Dr. Bertlyn Bosley,[1] Chief of the Nutrition and Dietetic Branch of the Division of Indian Health, Department of Health, Education, and Welfare, has underlined relationship of nutrition and health by stating "Nutritionists as well as other members of the health profession should be concerned about a death rate among Indian infants approximately three times that of the infants of the rest of the United States and the fact that the life expectancy for Indians is approximately 10 years less than for non-Indians."

In 1950 South Dakota ranked fifth among all States in total number of Indian people and third in largest proportion of Indians within the State's population. The census gave the State's Indian population as 23,344, approximately 4% of the total population. The 1960 census showed an increase to 25,794. Since total population also increased slightly the percentage of Indians was virtually unchanged. The Indian population consists largely of different tribes of the Sioux Nation. There are, however, some Mandan, Arikara, Gros Ventre, Black Foot and other tribes residing in the State. Of particular interest in connection with this study is number of Indian children of school age in South Dakota, which in 1956 was 10,031 according to the school census report of the United States Bureau of Indian Affairs. This figure included all Indian children ages 6-18 plus those older and younger, but attending school at the time. Dr. Vernon Malan, Professor of Rural Sociology, South Dakota State University, has provided valuable background information on the Dakota Indian,[7,8] part of which deals with acculturation in various aspects of living. No doubt, boarding schools are playing a part in this process as young people grow up and carry back to their people the way of life of non-Indians. This is true of eating practices and other changes they encounter in the boarding schools.

Further information on Indians of South Dakota has been provided by Gordon MacGregor[6] in his book "Warriors Without Weapons" published in 1946. MacGregor presents results of an interdisciplinary study conducted among 166 Sioux children 6 to 18 years old, from three communities on the Pine Ridge Reservation. The section of the book entitled "Health and Personality" is based on Dr. Dorothea Leighton's analysis of medical records secured through members of the local medical staff. The author qualifies the material in this fashion: "Because of the variations between medical examiners and because of lack of any absolute standards for good health or various dis-

*Professor, and assistant professor, Food and Nutrition Research, and graduate assistant, respectively. Miss Wenberg is now assistant professor, Department of Preventative Medicine, School of Medicine, Ohio State University, Columbus. Mrs. Boedeker is now a resident of Randalia, Iowa.

eased conditions that can be determined by a single routine examination, the analysis can hardly be considered conclusive." Later he adds that the same holds true for any determination of "adequate and inadequate nutrition." Findings reported were: generally good health—20%; undernourished—40%; decayed teeth—50%; enlarged tonsils—50%; and many with possible symptoms of vitamin deficiency, such as swollen gums, flaring ribs and enlarged sore tongues. It was pointed out that the classification of "undernourished" was determined by comparing each child's height and weight with the average for his tribal age group. Tribal age group physical measurements as a height-weight standard might be questioned. A controlled diet study was not possible, but information gathered indicated that the average meals of the children were inadequate in calories and yitamins. All children attended day schools in the three communities represented. In a grade school home economics class the answers received to questions on home breakfasts revealed that some of the children came to school without breakfast, that no child had milk or fruit, only one had an egg and that a typical breakfast might have consisted of cake purchased at the "trader's", fried bread or potatoes, or pancakes and syrup, and coffee.

In May 1958, the Division of Indian Health in the Aberdeen area began use of a pamphlet[5] designed to give information on the Pine Ridge Reservation as a means of orienting new employees assigned to duty there. The pamphlet is divided into narrative and statistical sections. Statistics on health include causes of death and major items of diet. Causes of death are listed in this order: pneumonia, wounds, accidents, etc., tuberculosis, malnutrition, diarrhea for young babies, and old age. Diet items include mush, potatoes, dried beans, Indian bread or baking powder bread, light bread, rice, some cheese, some dried fruits, beef (heart, kidney, ribs, hamburger), smoked bacon, fat back, bologna, frankfurters, cabbage, some canned milk, and some canned fruit. Milk, vegetables and fruits are obviously low.

A 1957 Public Health Service report covering the years 1949-53[11] shows the average annual birth rate for Indians was 32.1 per 1,000 population as compared with 24.5 per 1,000 for all races in the United States. This publication reported a larger proportion of children in the Indian population which in turn brought the birth rate when calculated per 1,000 women of child bearing age to a figure approximately 50% higher than that for the general population. A possible implication of these statistics is that the adolescent girl in the Indian population will be bearing children earlier, more frequently, and over a longer period of years than adolescent girls in the general population.

Most pertinent to the present study because of emphasis on diet and health conditions of South Dakota Indians is another study on the Crow Creek Reservation by Jessie Anderson Stene[9] in the summer if 1927. This has been reported in a dissertation written in partial fulfillment for the master's degree at the University of Chicago. Mrs. Stene was acquainted with the Federal officials at the reservation and the fact that members of her famiily lived in the area placed her in an advantageous position for obtaining the desired information. Her description of diets, methods of living and physical conditions probably have a high degree of accuracy for the period in which the study was made but certain changes likely have occurred since that time.

Of the total population (about 900), Mrs. Stene gathered information on 323 individuals comprising

Girls at work in clothing laboratory at Oglala Community School at Pine Ridge.

67 families living on the reservation. Adults (21 years of age and above) included 131 individuals. Of 192 children only 16 were under 2 years of age. The remaining children were in three groups—pre-school, school age, and over 18 years of age—with approximately one-third in each group.

Information was obtained by use of a comprehensive questionnaire which the investigator completed in the homes by asking questions of an adult in the family and by making personal observations. Adults in about one-fourth of the families visited did not speak English so it was necessary to have an interpreter during the family interview. To verify and supplement information obtained at the homes, Mrs. Stene studied official records on family and medical histories which were made available to her. She also consulted storekeepers as to buying practices, the Agency Issue Clerk as to "Ration Rolls", government physicians as to health and home conditions and teachers in regard to cleanliness and physical condition of children in school. Some reference was made to a boarding school, which was probably the school at Pierre, in connection with health of the children, but no mention was made of any school feeding program.

At the time of the study the "Ration Roll", with some exceptions, was limited to the older Indians with no other means of obtaining subsistence. Rations, issued monthly, included the following: beef, 25-40 pounds; salt pork instead of beef twice a year, 10 pounds; flour or hardtack (alternated), 15 pounds; sugar, 2½ pounds; coffee, 2½ pounds; rice or beans (alternated), 2½ pounds; baking powder, ¼ pound; and a 15-pound bag of cornmeal, if subsistence ran out before the next ration issue.

The author considered that both "faulty diet" and "faulty food habits" contributed to the malnutrition observed. Of 94 children between 1 and 12 years of age, only 38 drank milk, and of 68 children under 7 years of age, 46 were drinking coffee. In 48 families children had candy after they were a year old and in 26 families infants of less than a year were given candy.

Adequacy of the diets was classified in the following descending order: 1—those containing meat or eggs and small amounts of milk, vegetables and fruits; 2—similar to No. 1 but lacking either vegetable or fruit; 3—those containing bread, coffee, meat, and potatoes or beans; and 4—those consisting chiefly of bread and coffee. It is probable that diets in the first two categories included bread also. Only five families with a total of 10 children had diet 1; 19 families with 44 children diet 2; 28 families with 106 children diet 3; and 15 families with 32 children diet 4.

Girls at work in food laboratory at Oglala Community School at Pine Ridge.

Home grown vegetables, other than beans and potatoes, were limited to squash and corn. Purchased canned vegetables were limited to tomatoes and peas. Vegetables were used mainly as soup ingredients and home grown corn and squash were dried for this purpose. Fruit purchases were chiefly dried raisins, peaches and prunes and occasionally oranges or bananas. Wild chokecherries, grapes, and plums were gathered, sometimes made into jelly or sauce, and canned, or preserved by drying.

Classification of the 192 children on the basis of relation of weight to height showed 52 thin, 22 fat, and 118 medium.

Medical histories and vital statistics records available for 58 of the families indicated that out of 325 children born, 161 were living. Of the 164 deceased children, only 2 were from families with diet 1, which was considered most adequate; 38 were from families with diet 2; 78 from families with diet 3; and 52 from families with diet 4.

Sore eyes and blindness were prevalent and bowed legs and poor teeth were common. Mrs. Stene felt that incidence of tuberculosis was higher than the agency physician was willing to admit. Her opinion was supported by statistics on deaths of children from known causes, which indicated that 55 out of 107 (almost half) had resulted from tuberculosis. Pneumonia or flu accounted for 35 of the deaths, which gave further evidence of low resistance to respiratory infections.

Poor living conditions and general hygiene were recognized as factors involved in the health of the Crow Creek Indians, but Mrs. Stene regarded diet as the "biggest responsible factor."

PURPOSE OF THE STUDY

This study, which deals with the nutrient intake of Indian boarding school children, was carried out in conjunction with a larger study in which South Dakota State University cooperated with the National Institutes of Health and the Indian Health Division of the United States Public Health Service. Objectives of the study as a whole were: (a) observe effect of a supplement of di-calcium phosphate on prevention of dental caries; (b) obtain information on nutritive value of boarding school diets; (c) obtain height and weight data for consecutive periods that might be used for developing standards for Indian children of the Dakotas; and (d) attempt to relate rate of growth and dental and periodontal findings to nutrient intake. This report as it concerns the total group of children deals only with dietary aspects of the study. But, because of a special interest of one of the investigators (M. T .B.), in the adolescent Indian girl, there is included in addition to dietary data some information on the physical and physiological development of 12-to-14 year-old girls. Later reports, to appear elsewhere, will present observations on heights and weights and dental findings for all children studied.

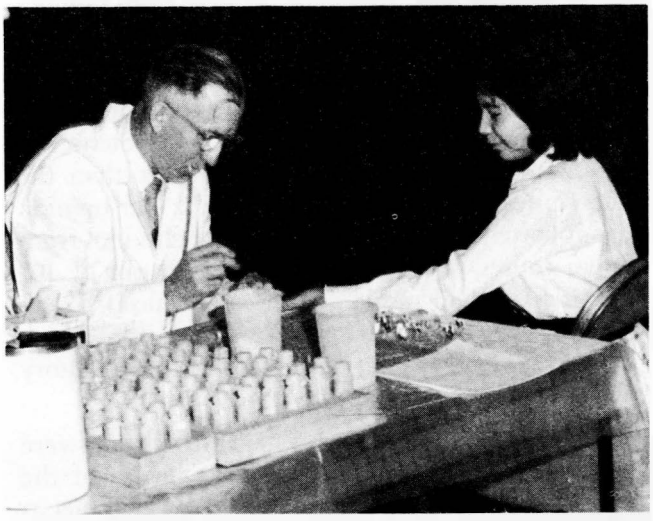
PLAN OF STUDY

Eight Indian boarding schools of the Dakotas were selected for study. Four were operated by the Bureau of Indian Affairs (BIA) and four were mission schools. In two schools of each type, diets of children were supplemented with di-calcium phosphate mixed with sodium chloride incorporated into the bread. These were designated as experimental schools, with the other four serving as contols.

Data were obtained through observations at meal time on food consumed by the children and through inventories of the foods available.

The boarding school situation afforded an opportunity for a degree of control often not attainable in dietary studies. But a number of variables are recognized for which it was impossible to take full account in evaluating the results of the study. Some of these variables were vacation diets, food sent to the children from home, candy, provided by philanthropic individuals and organizations. However, the children were asked to report on food eaten other than at mealtime.

Dr. Olaf Mickelsen obtaining samples for hemoglobin determination. Oglala Community School, Pine Ridge.



Dietary Observations Procedures

Following a pilot study in two schools to standardize procedures dietary observations were made in each of the eight schools for 7-day periods in the late fall of 1959 and early spring of 1960, and for 5-day periods in the fall of 1960 and spring of 1961. The shorter observation period was adopted during the second year of the study, since, through the analysis of data, it was learned that results for 5- and 7-day periods were comparable. Boys and girls of three age groups 7-8, 9-11, and 12-14 years were observed. Five different children from each of the six sex-age groups were selected for observation each day. In this way all of the children 7 to 14 years of age in the eight schools were included in most instances. In a few situations the small number in a particular age group made duplication necessary during an observation period. Also, because of the small enrollment in one school (No. 5) in the fall of 1959 and spring of 1960, the number varied from three to five.

Children to be observed on a given day were supplied (the evening before or on the morning of the observation day) with brightly colored ribbons which they were asked to wear throughout the day. They considered the ribbons a mark of distinction which they made every effort to merit by giving wholeheart-

Bun time at St. Francis Mission School.

ed cooperation. Ribbons served as a means of identification and also as a reminder to the children that they were to see the nutrition investigator immediately after each meal to report on what they had eaten. At this time they were also to report anything eaten between meals. The report was given in terms of number of servings of each item of the meal, average weights of which were determined. A mean number of servings for the five children of each sex-age group was then computed for use in nutrient evaluation. Information on kinds and amounts of ingredients of mixed dishes and total yields of cooked food from recipes used was obtained in the kitchen during preparation of meals as a basis for computing nutrients of servings of items of this type.

In addition to these procedures, an effort was made to obtain data for nutrient evaluation of diets by use of the inventory method. A yearly inventory was first attempted, but did not prove satisfactory due to lack of conformity in keeping records. Application of this method in the second year of the study during the week when observations were being made in the dining room proved more satisfactory, and could be used as a rough check on dining room observations. Standard food composition tables were used for estimating nutrient values of servings of both single foods and mixed dishes. The coded data were transferred to IBM cards and calculations were carried out by an electronic computer. During the 1959-1960 study aliquots of the mean quantity of the different food items consumed each day by groups of five children of each sex-age classification were made into weekly composites for chemical analysis. Samples were analyzed for protein fat, total ash, calcium and phosphorus.

Other Observations on 12-14 Year-Old Girls*

Heights and Weights. Height and weight measures in this report were obtained cooperatively with personnel of the National Institutes of Health and the Indian Health Division of the United States Public Health Service. Procedures were established by the NIH group and standardized portable equipment supplied by NIH was used. Heights were measured to the nearest quarter inch and weights to the nearest half pound. Measurements were taken with subjects in light clothing and without shoes.

Age at Menarche. With cooperation of school personnel, it was possible to schedule meetings with groups of adolescent girls for the purpose of interviewing them concerning age at onset of menstruation. Further information was secured through dormitory advisors. Data on age at menarche was thus obtained on 259 girls residing in six of the schools under study.

Hemoglobin. Hemoglobin levels were determined by the National Institutes of Health on the basis of an approximate 10% sampling of the total group of children in four schools and data was made available to the authors on 133 of the 12-14 year-old girls. Drabkin's method[2] which utilizes standard solutions considered both stable and accurate for this purpose was employed. It is recommended for clinical hemoglobinometry by the United States armed services medical group.

Results and Discussion

Dietary Observations. Table 1 presents estimated mean daily nutritive values of diets of the individual schools based on mealtime observations. Table 2 gives mean values by age and period for all 8 schools. Percent of total calories derived from each of the organic nutrients is given in table 3. Table 4 records data obtained by chemical analyses.

Diets of the 7-8 year-old group both years of the observations approximated, equaled or exceeded the NRC Recommended Allowances (see appendix) for calories and all nutrients with the exception of ascorbic acid, which was frequently below the recommended amount in a number of the schools. Larger numbers of diets failed to reach recommended amounts for older groups particularly the girls. Ascorbic acid was below the recommended amounts in diets of 12-14 year-old girls in all eight schools both years of the study.

While ascorbic acid levels below the NRC Recommended Allowances were most frequently observed,

*Data obtained from a thesis by Margaret Talcott Boedeker in partial fulfillment of requirements for the M.S. degree.

diets of older groups, especially girls, were below recommendations in a number of respects. Table 5 indicates percentages of NRC Allowances furnished by the diets. The frequent failure of 12-14 year-old Indian girls to meet dietary recommendations is in line with studies of non-Indian girls of this age group. There is much concern over quality of diets of teenage girls, many of whom will be undergoing the stress of child bearing in a few years.

While the NRC Recommended Daily Dietary Allowances furnish a useful yardstick for evaluation of diets, they are liberal and have been considered a third higher than actual needs of most normal, healthy individuals. Recommendations for ascorbic acid in particular are regarded by some authorities as well above the minimal requirement for health. However, optimal levels for children have not been established, and today we are more concerned with providing diets that will promote the highest level of health than with merely adequate diets. With this as an objective, it would seem desirable for some schools to seek to increase consumption of citrus fruits and vitamin C rich vegetables.

As might be expected, nutritive values based on inventories were usually somewhat higher than values based on data obtained through observation at mealtime. Values based on records obtained during the periods of dining room observations are in table 6.

The mean percentage of calories derived from protein did not differ greatly among diets of the eight schools (table 3). Also little difference was noted among age groups. There was a wider variation for fat and carbohydrates, with a range among the eight schools of fat calories from 24% to 44% for 1959-60 observations and 25% to 45% for 1960-61 observations. Lowest percentages for fat were found in diets of school 7. This was true for all three age groups. Calories derived from carbohydrates ranged from 43% to 63% and 36% to 63% for the two observation periods respectively, with highest values occurring in school 7. Higher levels of carbohydrate were associated with high consumption of cereal products.

Teenage girls at lunch, BIA Indian School at Wahpeton, North Dakota.

The mean estimated and analyzed values for protein and calories (with the exception of calorie values for the 7-8 year-old girls) did not differ much, but all estimated fat values were considerably higher than the analyzed. This might be expected, since the samples of meat on which the figures in the standard food table used are based had higher fat content than meats as they are purchased and served today.

In estimating calcium content of diets, no account was taken of di-calcium phosphate added to the bread of the experimental schools, since in order to avoid bias in evaluating the overall results, the identity of the experimental schools was not generally known to the investigators. One person was made responsible for selecting schools to receive the small bags of salt containing di-calcium phosphate. Estimated calcium values of diets of the two types of schools differed only with variations in natural sources of calcium in the diets. Phosphorus was not estimated, but analyzed values for both calcium and phosphorus, as was anticipated, were always higher for experimental schools than for control schools.

Table 7 shows mean calories and nutrients per day for all four periods in diets of BIA schools compared with mission schools. Largest differences occurred in fat, vitamin A and ascorbic acid levels of the diets, which were lower in the mission schools. This is explained chiefly by less frequent inclusion of meat and smaller variety of fruits and vegetables in diets of mission schools. Citrus fruits in particular were served less frequently in mission schools, breakfast usually consisting of a cereal, bread and butter and milk. As can be seen by calcium levels, both types of schools provided liberal amounts of milk.

Milk and bread were important sources of protein in diets of mission schools. Both bread and cereal consumption was high in mission schools. Bread baked in these schools was often of superior quality. Excellent use was made of donated fat-free milk, dried eggs and sometimes cheese in preparation of bread. Much of the bread was graham or whole wheat, which also contained dark molasses.

It is thought that lower nutritive value of diets of mission schools as compared with BIA schools can be attributed to a considerable extent to a difference in amount of money available for purchase of food.

Analysis of Variance*. An analysis of variance was made to test significance of variations in nutritive

*Analyses were made in the statistical laboratory of Iowa State University under direction of Dr. Donald K. Hotchkiss.

values of the diets. Results of the statistical treatment of data are found in the appendix. Differences observed between the two types of schools, BIA and mission, were not significant, but for schools within a type differences were significant for iron, thiamine and niacin at the 1% level of probability and for calcium and riboflavin at the 5% level. Variations in nutritive value of diets for the two years were not significant, but interaction of year and type of school showed significant differences for thiamine (1% level) and niacin (5% level). For interaction of year and schools within a type, variations were highly significant for calories, protein, fat, calcium, riboflavin, and ascorbic acid, and significant at the 5% level of probability for iron and niacin.

Sex differences were significant for calories and all nutrients at the 1% level, with the exception of fat and iron, which were significant at the 5% level. Interaction of sex and type of school indicated significant variations for vitamin A and ascorbic acid (1% level) and fat, calcium and riboflavin (5% level) and the interaction of sex and schools within a type for calories, thiamine and riboflavin (1% level) and protein, fat and calcium (5% level). No significant differences were found for the sex-year interaction. There were no significant differences between periods, or for interaction of period and type of school, but interaction of period and schools within a type showed significant variations for all nutrients at the 1% level, with the exception of vitamin A and niacin, which differed significantly at the 5% level.

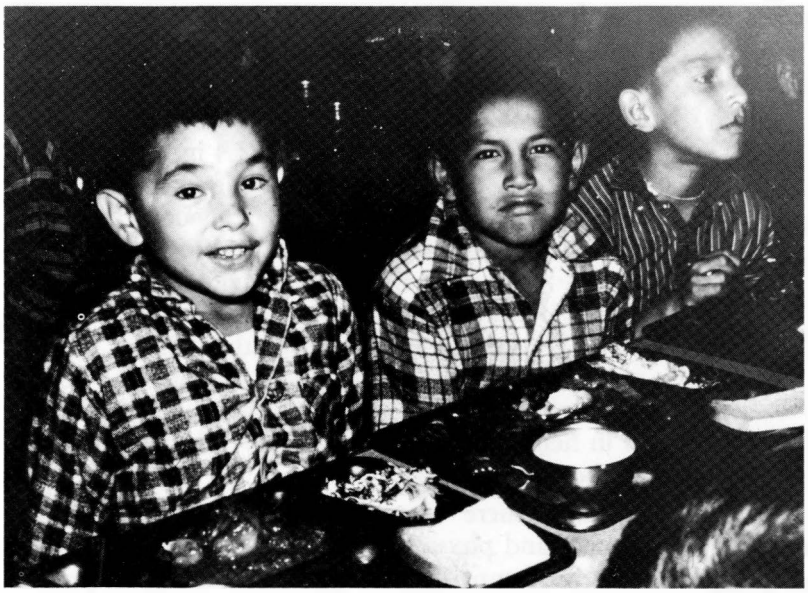
Age differences were significant for iron and niacin at the 1% level and for calcium at the 5% level. Significant variations were found for the age-sex interaction at the 1% level for calories, protein, calcium, thiamine, and riboflavin and at the 5% level for iron and niacin. Interaction between age and type of school revealed significant differences for niacin (1% level) and thiamine (5% level), and the interaction between age and schools within a type for calcium and riboflavin (1% level) and calories (5% level). Age-year and age-period interactions indicated that variations were not significant for any of the nutrients.

Height and Weights of 12-14 Year-Old Girls. Table 8 records heights and weights for three sucessive seasons of 12-, 13- and 14-year-old girls enrolled in the eight boarding schools. Increments in height from one age level to another were approximately 2 inches and in weight 10 to 12 pounds. A greater increase in both heights and weights occurred in 12- and 13-year-old groups than in the 14-year-old during a nine months period. The increases in height were more marked at the earlier ages than were increases in weight. Contrary to expectations, based on the probability that home diets would be less adequate than boarding school diets, no slowing up of growth was noted during the summer months.

Twelve year old girls gained 1.4 inches in height and 5.5 pounds in weight during the summer months and only 0.6 inch in height and 3.5 pounds in weight during the fall months. Corresponding gains for 13-year-old girls were 1.6 inches in height and 8 pounds in weight during the summer and 0.2 inches in height and 2.5 pounds in weight during the fall. For 14-year-old girls, gains were 0.9 inches in height and 1 pound in weight between April and September and 0.6 inches in height and 1.5 pounds in weight between September and January.

Since there are no published "standards" for growth and physical condition of Sioux Indian children for comparison, the percentile rating of the Dakota adolescent Indian girls was determined by using Stuart-Meredith norms[10] as "standards." As indicated in table 9, heights fall in the 25th and 27th percentiles which characterizes the girls as "short and moderately short." However, weights place them in the 52nd to 53rd percentiles or average weight zone. But, since they were below average in height, they were heavier than non-Indian girls of like age when weight was related to height, and therefore were of a stockier build. They were taller than adolescent Papago[13] and

Margaret T. Boedeker, of South Dakota State University, measuring height of a teenage Indian girl.



Young Indian boys at mealtime at St. Paul's, Marty, South Dakota.

Navajo[3] Indian girls. They were lighter than the Papago girls but heavier than the Navajos.

Relation of Age at Menarche to Physical Measurements. The age at menarche was found to be similar to that reported for non-Indian girls[12]. A larger number began to menstruate at about 13 years of age. Relationship between physical and sexual development observed by Gschneider *et al.*[4] was also observed in this study. Girls who began to menstruate at an early age were taller and heavier than those who menstruated later. At 12 and 13 years of age there is a spread of 4 to 6 inches in height and 16 to 26 pounds in weight between those who had not reached menarche and the few girls who menstruated before 11 years 6 months of age. This relationship between physical development and menarcheal age is indicated in table 10.

Hemoglobin Levels. The mean hemoglobin values for the combined three age groups was 11.6 gm/100 ml. of blood in the fall and 11.7 in the spring (table 11). Hemoglobin levels reported for Papago[13] and Navajo[3] adolescent girls are higher than levels observed in this study. The mean hemoglobin level for 53 Papago girls was 12.5 gm/100 ml. of blood and only 7% of a group of Navajo girls had hemoglobin below 12.3 gm./100 ml. of blood. Hemoglobin levels of 50% of the Navajo girls were higher than 14.2 gm./100 ml. of blood. Geographic location, involving high elevation, may explain in part the higher hemoglobin levels of the Papago and Navajo Indian girls. However, it is likely that a number of factors contributed to the differences observed.

In adults hemoglobin levels are often lowered through blood loss. With adolescent girls menstrual loss could influence hemoglobin concentration adversely. Data on hemoglobin and age at menarche was examined to determine whether the latter had exerted any influence on the hemoglobin level, but no clear cut relationship could be found. This is in agreement with observations of Gschneider *et al*[4]. who reported that the hemoglobin levels for earlier maturing girls were essentially the same as for those who matured later. There was likewise no evident relationship between iron and/or protein content of current diets and hemoglobin levels.

It is hoped that results of this study will be of interest and value to those responsible for feeding of children in Indian boarding schools and to others seeking information on development of adolescent girls in the particular segment of our society represented by the Sioux Indians of South Dakota.

A group of Indian children at St. Francis Mission School.

SUMMARY

Information was obtained on kinds and amounts of foods consumed by children of both sexes of three age groups, 7-8, 9-11, and 12-14 years in eight boarding schools, four BIA and four mission schools. The study covered two 7-day periods during the school year of 1959-60 and two 5-day periods during 1960-61. One period each year was in the fall and one in the spring. Standard food tables were used to estimate nutrient intakes, and chemical analyses were made on food composites for certain nutrients.

Diets of 7-8-year-old children, in both years of observations, approximated, equalled or exceeded the NRC Recommended Allowances for calories and all nutrients with the exception of ascorbic acid, which was frequently below the recommended amounts. While ascorbic acid levels below the NRC Recommended Allowances were most often observed, diets of older groups, especially the 12-14 year-old girls, were also below recommendations in a number of other respects. The frequent failure of adolescent Indian girls to meet dietary recommendations is in line with studies on non-Indian girls. This is a matter of concern to nutritionists, since many of these girls will soon be undergoing the stresses of pregnancy for which nutritional reserves are needed. While NRC Recommended Allowances are liberal, particularly with respect to ascorbic acid, nutritional scientists might well question whether the lowest values found in this study approach the optimal for children.

An analysis of variance was made to determine significance of nutrient differences observed between types of schools, schools within a type, year, period, age, sex.

Mean heights of 12-14 year-old Indian girls of this study places them in the short classification in relation to Meredith norms, but weights were near average. This indicates they are of a stockier build than non-Indian girls of like age. Obesity was not commonly observed.

The age at menarche was found to be similar to that of the general population of the United States. Girls who menstruated early were taller and heavier than those in whom sexual maturation occurred at a later age. These observations are in agreement with those of Gschneider *et al.* on non-Indian girls. Mean hemoglobin values were slighly below 12 grams per 100 ml. of blood, which, at best, can be considered only fair. This level was definitely lower than that of Papago and Navajo Indian girls. The higher altitude at which the latter live may be an influencing factor that accounts in part for this difference. No explanation of the relatively low hemoglobin levels of the girls included in this study can be offered on the basis of current diets. However, earlier dietary inadequacies may be reflected or a number of unknown factors including a genetic influence may be involved. Further investigation is needed to seek a causative relationship of any kind.

Table 1. Mean Daily Nutritive Values of Diets of Individual Schools

1959-60 — PERIOD I

	Calories		Protein gm.		Fat gm.		Calcium gm.		Iron mg.		Vitamin A I.U.		Thiamine mg.		Riboflavin mg.		Niacin mg.		Asc. A. mg.	
	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
Age 7-8																				
School 1	2,851	2,494	98	87	134	116	1.7	1.6	13	12	6,347	5,796	1.54	1.32	3.05	2.70	15	13	81	70
2	2,640	2,558	91	87	109	107	1.4	1.4	13	12	5,443	5,130	1.60	1.52	2.64	2.52	14	13	72	65
3	2,219	2,409	71	82	81	93	1.3	1.6	9	10	3,632	4,280	1.28	1.44	2.34	2.74	11	12	36	43
4	2,616	2,590	90	90	100	99	1.7	1.6	14	14	4,925	4,665	1.80	1.79	2.92	2.84	13	14	59	62
5	2,247	2,211	72	71	108	104	1.5	1.4	9	9	4,774	5,142	1.18	1.16	2.85	2.47	10	10	53	56
6	2,338	2,575	76	85	82	106	1.2	1.5	12	11	6,101	3,379	1.51	1.66	2.66	2.84	13	14	34	49
7	2,251	2,108	77	69	60	61	1.0	0.9	14	14	4,062	5,136	1.89	1.73	2.13	1.87	16	14	39	42
8	2,524	2,392	78	73	115	106	1.1	1.0	15	14	7,476	7,031	1.72	1.63	2.25	2.10	15	14	88	82
Age 9-11																				
School 1	2,880	2,403	94	78	130	108	1.5	1.2	14	12	6,907	5,351	1.53	1.26	2.72	2.27	16	13	74	67
2	2,928	2,526	102	85	126	104	1.5	1.3	15	12	5,495	4,841	1.77	1.58	2.82	2.49	16	13	81	72
3	2,185	2,078	72	68	83	81	1.1	1.2	10	9	3,564	3,670	1.30	1.23	2.07	2.13	13	11	40	38
4	2,741	2,495	90	85	102	96	1.6	1.5	14	13	4,719	4,206	1.89	1.73	2.85	2.68	14	13	59	57
5	2,606	2,302	83	74	121	106	1.4	1.2	12	11	6,464	6,011	1.42	1.25	2.57	2.32	14	12	71	64
6	2,424	2,850	82	88	91	120	1.2	1.3	13	13	4,538	3,513	1.57	1.88	2.62	2.70	14	16	33	58
7	2,154	2,032	71	66	57	61	0.9	0.8	14	13	4,384	4,408	1.76	1.62	1.93	1.78	14	14	30	36
8	2,559	2,498	78	75	112	113	1.1	1.0	16	15	6,672	6,877	1.84	1.68	2.30	2.12	16	15	83	86
Age 12-14																				
School 1	3,096	2,297	98	75	134	105	1.5	1.1	15	12	6,725	5,070	1.64	1.18	2.82	2.02	17	13	84	72
2	2,591	2,518	84	85	104	107	1.6	1.2	14	13	5,687	4,496	1.74	1.64	2.83	2.46	15	14	74	65
3	2,327	2,151	76	71	84	86	1.2	1.3	10	9	3,730	3,774	1.36	1.23	2.31	2.25	14	11	40	42
4	2,759	2,554	88	84	102	95	1.4	1.4	15	14	4,140	3,821	1.94	1.78	2.69	2.51	15	14	57	58
5	1,838	2,265	53	70	84	102	0.8	1.1	8	10	4,642	5,565	1.29	1.25	1.65	2.24	12	11	42	61
6	2,071	2,447	67	74	78	105	1.0	1.1	10	11	3,230	2,606	1.32	1.55	2.14	2.28	12	13	29	42
7	2,240	2,064	76	64	63	62	1.0	0.7	14	13	5,817	4,115	1.84	1.63	2.13	1.65	15	14	39	41
8	2,893	2,388	89	71	132	110	1.1	0.9	18	14	7,120	6,517	2.09	1.62	2.54	1.97	18	14	96	75

1959-60 — PERIOD II

	Calories		Protein gm.		Fat gm.		Calcium gm.		Iron mg.		Vitamin A I.U.		Thiamine mg.		Riboflavin mg.		Niacin mg.		Asc. A. mg.	
	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
Age 7-8																				
School 1	2,771	2,461	102	89	121	109	2.1	1.8	12	11	6,239	5,252	1.57	1.32	3.40	2.92	14	12	77	65
2	2,480	2,379	85	81	102	96	1.3	1.3	13	13	6,600	7,267	1.40	1.46	2.39	2.28	14	13	79	78
3	2,155	2,339	74	84	70	80	1.1	1.3	13	12	3,098	4,354	1.47	1.52	2.11	2.40	12	12	47	48
4	2,639	2,574	82	83	144	145	1.3	1.4	14	13	3,975	4,228	1.72	1.65	2.51	2.91	13	13	58	56
5	2,071	1,948	73	68	86	81	1.4	1.3	10	9	5,120	5,200	1.16	1.24	2.51	2.36	11	10	82	63
6	2,712	2,575	88	85	111	106	1.4	1.5	13	11	3,516	3,379	1.85	1.66	2.86	2.84	16	14	52	49
7	2,298	2,101	74	70	64	64	0.9	1.0	14	12	4,062	9,039	1.89	1.59	1.97	2.24	17	14	50	43
8	2,465	2,288	79	71	116	105	1.2	1.2	13	12	7,407	6,996	1.59	1.50	2.40	2.22	14	12	68	64
Age 9-11																				
School 1	2,900	2,406	103	85	125	104	1.8	1.5	14	11	6,416	5,472	1.63	1.34	3.12	2.64	16	13	78	65
2	2,638	2,556	89	86	109	104	1.4	1.4	13	14	6,118	6,340	1.49	1.40	2.55	2.46	14	14	87	77
3	2,444	2,043	84	69	76	69	1.2	1.0	14	11	3,910	3,828	1.66	1.38	2.35	2.04	13	11	46	41
4	2,847	2,435	90	77	165	146	1.5	1.3	15	11	4,302	3,716	1.89	1.52	2.77	2.44	14	12	58	51
5	2,292	2,081	78	72	92	83	1.1	1.1	13	11	5,352	4,731	1.28	1.14	2.23	2.12	14	12	74	59
6	2,766	2,850	86	88	114	120	1.4	1.3	13	13	4,234	3,513	1.92	1.88	2.81	2.70	16	16	48	58
7	2,539	2,082	83	68	75	60	0.9	0.8	16	13	8,004	8,712	1.98	1.70	2.28	2.09	18	16	52	49
8	2,377	2,209	74	69	106	103	1.1	1.1	13	12	6,127	5,848	1.66	1.50	2.31	2.16	14	12	70	60
Age 12-14																				
School 1	2,721	2,078	95	69	118	88	1.6	1.1	13	10	6,293	4,394	1.54	1.19	2.92	2.09	15	11	71	57
2	2,692	2,493	87	81	114	96	1.4	1.2	15	14	5,658	5,557	1.72	1.49	2.69	2.34	16	15	83	85
3	2,339	1,963	78	66	77	65	1.2	0.9	13	12	3,590	4,019	1.55	1.34	2.21	1.85	12	11	47	46
4	2,928	2,714	91	83	173	156	1.4	1.3	14	13	4,008	3,783	1.88	1.75	2.80	2.58	15	14	59	65
5	1,712	1,999	61	66	49	82	0.8	1.0	11	10	7,284	3,949	0.94	1.07	1.58	1.99	12	11	65	59
6	2,719	2,447	84	74	112	105	1.4	1.1	12	11	3,576	2,606	1.84	1.55	2.76	2.28	15	13	46	42
7	2,762	2,237	89	71	89	68	1.1	0.8	16	14	8,145	11,650	2.09	1.69	2.66	2.23	20	16	63	40
8	2,800	2,163	88	65	129	96	1.4	1.0	15	12	6,971	4,134	1.97	1.48	2.74	2.01	16	12	86	56

Table 1—(Continued on next page)

Table 1. Mean Daily Nutritive Values of Diets of Individual Schools (Continued)

1960-61 — PERIOD I

	Calories		Protein gm.		Fat gm.		Calcium gm.		Iron mg.		Vitamin A I.U.		Thiamine mg.		Riboflavin mg.		Niacin mg.		Asc. A. mg.	
	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
Age 7-8																				
School 1	2,805	2,434	106	93	146	122	1.7	1.4	15	13	8,256	7,861	1.58	1.38	3.11	2.55	14	13	87	78
2	2,352	1,906	80	61	99	80	1.1	0.9	13	10	8,356	5,462	1.66	1.29	2.29	1.82	13	10	65	49
3	2,255	2,302	79	82	81	86	1.4	1.4	12	12	4,026	4,328	1.43	1.47	2.31	2.44	13	12	63	63
4	2,312	2,365	78	81	104	112	1.4	1.4	13	14	3,160	3,501	1.77	1.74	2.91	2.91	13	13	48	53
5	2,536	2,416	87	80	121	115	1.6	1.4	11	11	5,888	5,369	1.49	1.37	2.72	2.45	13	12	67	66
6	2,441	2,269	83	74	92	86	1.4	1.2	13	12	4,497	4,484	1.52	1.31	2.62	2.34	12	10	53	50
7	2,712	2,049	81	61	79	58	0.8	0.8	17	13	10,308	8,141	2.13	1.67	2.39	1.94	18	12	70	50
8	1,900	1,910	67	68	72	72	1.1	1.1	11	12	3,775	3,624	1.51	1.57	2.22	2.24	12	12	93	89
Age 9-11																				
School 1	3,282	2,356	118	84	167	118	1.5	1.1	18	13	9,131	6,068	1.78	1.35	3.05	2.20	17	13	93	78
2	2,549	2,076	85	67	108	83	1.2	1.0	14	11	8,801	4,259	1.80	1.44	2.46	1.99	14	11	69	41
3	2,479	2,146	107	75	88	74	1.3	1.2	14	12	3,965	4,236	1.54	1.40	2.33	2.17	15	12	67	56
4	2,470	2,238	78	74	108	110	1.3	1.2	14	12	2,918	2,957	1.86	1.61	2.71	2.99	14	12	49	46
5	2,399	2,405	78	77	112	115	1.2	1.2	11	11	5,524	5,576	1.40	1.40	2.21	2.19	13	13	65	62
6	2,594	2,303	86	74	101	90	1.4	1.2	14	12	4,358	4,272	1.62	1.37	2.74	2.40	13	11	57	49
7	2,430	2,170	73	63	71	62	0.6	0.8	16	14	7,567	9,197	1.88	1.81	1.88	2.02	16	12	59	56
8	2,125	1,858	76	67	80	73	1.2	1.1	13	11	4,402	3,667	1.80	1.55	2.49	2.41	14	12	99	88
Age 12-14																				
School 1	3,311	2,347	121	86	174	121	1.6	1.0	19	13	6,967	5,131	1.95	1.38	3.11	2.09	19	14	99	84
2	2,696	2,290	87	73	110	96	1.3	1.0	14	12	7,536	4,900	1.86	1.70	2.60	2.24	15	13	74	47
3	2,241	1,847	78	66	79	67	1.2	0.9	12	10	3,587	3,706	1.44	1.22	2.12	1.83	13	11	53	46
4	2,497	2,368	75	76	111	108	1.3	1.3	12	14	2,654	3,156	1.59	1.69	2.54	2.60	12	14	40	70
5	2,644	2,039	84	63	128	98	1.2	0.9	12	10	5,823	4,422	1.57	1.20	2.36	1.73	15	11	69	52
6	2,443	2,054	74	65	88	81	1.2	1.1	13	10	4,831	3,544	1.61	1.18	2.44	2.08	12	9	46	42
7	2,518	2,028	74	58	77	58	0.8	0.6	16	13	9,114	7,185	1.97	1.59	2.23	1.67	16	13	60	55
8	2,222	1,648	79	59	83	64	1.1	0.8	14	11	4,332	2,984	1.98	1.46	2.47	1.78	16	12	98	63

1960-61 — PERIOD II

	Calories		Protein gm.		Fat gm.		Calcium gm.		Iron mg.		Vitamin A I.U.		Thiamine mg.		Riboflavin mg.		Niacin mg.		Asc. A. mg.	
	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
Age 7-8																				
School 1	2,843	2,612	105	93	133	120	2.0	1.8	13	11	8,867	6,933	1.59	1.40	3.44	3.08	14	13	77	69
2	2,560	2,085	90	71	98	84	1.0	0.8	15	11	4,897	4,106	1.76	1.38	2.17	1.78	15	12	79	46
3	2,470	2,282	78	78	98	87	1.3	1.3	12	11	3,519	3,725	1.40	1.42	2.31	2.40	12	12	64	64
4	2,218	2,297	79	81	76	78	1.3	1.4	12	12	7,116	5,650	1.42	1.50	2.68	2.72	13	13	70	67
5	2,540	2,557	89	88	115	112	1.6	1.6	12	12	11,750	9,732	1.32	1.32	3.15	3.01	12	12	43	43
6	2,527	2,241	87	80	92	84	1.5	1.3	14	12	2,966	3,358	1.58	1.38	2.80	2.54	13	12	48	48
7	2,126	1,927	67	65	58	57	0.8	0.9	13	12	4,331	3,871	1.67	1.26	1.87	1.83	14	13	37	41
8	2,268	2,191	82	79	84	83	1.2	1.3	14	13	4,948	4,656	1.83	1.75	2.45	2.49	16	15	61	59
Age 9-11																				
School 1	2,789	2,218	95	76	128	101	1.3	1.1	14	11	7,956	5,352	1.56	1.27	2.68	2.17	16	13	88	62
2	2,730	2,356	93	83	105	83	1.0	0.9	16	13	5,167	4,112	1.85	1.44	2.27	1.99	15	14	68	52
3	2,354	2,268	70	75	90	83	1.0	1.2	12	12	3,340	3,458	1.37	1.49	1.93	2.25	11	12	62	64
4	2,572	2,290	86	80	85	78	1.5	1.4	14	12	5,426	6,105	1.63	1.51	2.85	2.71	13	13	72	65
5	2,882	2,344	101	99	148	101	1.8	1.4	13	12	12,328	9,248	1.48	1.25	3.45	2.67	14	11	51	40
6	2,498	2,381	82	81	90	94	1.3	1.3	14	13	2,826	3,700	1.54	1.38	2.51	2.47	13	12	40	41
7	2,527	2,123	79	67	73	61	1.0	0.8	15	13	4,304	3,476	1.94	1.59	2.22	1.90	16	14	45	42
8	3,038	2,365	112	87	113	86	1.8	1.2	18	15	5,799	4,718	2.57	1.92	3.57	2.58	21	17	71	62
Age 12-14																				
School 1	3,002	2,418	106	82	139	113	1.6	1.2	14	11	8,646	5,984	1.73	1.36	3.10	2.43	17	14	77	66
2	2,734	2,570	93	88	108	101	1.0	0.9	15	14	4,062	4,170	1.93	1.90	2.38	2.16	16	15	59	65
3	2,291	1,967	73	60	87	78	1.1	0.9	11	10	2,959	3,068	1.36	1.18	2.06	1.76	12	10	50	48
4	2,466	2,544	81	82	83	90	1.3	1.3	13	14	5,158	6,215	1.62	1.59	2.66	2.64	14	14	62	69
5	2,829	2,284	94	76	122	121	1.5	1.1	13	11	12,008	6,717	1.50	1.19	3.10	2.27	15	12	54	37
6	2,108	2,141	71	74	78	84	1.1	1.1	12	12	2,202	3,100	1.35	1.29	2.18	2.21	11	11	28	35
7	2,303	1,901	73	59	69	62	0.8	0.6	14	13	3,733	4,355	1.79	1.47	1.98	1.57	15	14	37	41
8	2,901	2,156	109	79	113	81	1.5	1.1	19	14	6,134	4,081	2.60	1.85	3.21	2.32	22	16	80	56

Table 2. Mean Daily Calorie and Nutrient Value of the Diets (8 Schools)

	Energy cal.	Protein gm.	Fat gm.	Calcium gm.	Iron gm.	Vit. A. IU	Thiamine mg.	Riboflavin mg.	Niacin mg.	Asc. A. mg.
Year 1										
Period 1—Fall										
Boys 7- 8	2,461±62	82±2.2	98±4.2	1.4±0.047	12±0.45	5,358±459	1.56±0.044	2.72±0.074	14±0.46	56±3.8
9-11	2,310±74	84±2.6	103±4.6	1.3±0.045	14±0.44	5,343±376	1.64±0.044	2.49±0.070	15±0.52	58±4.2
12-14	2,558±78	82±2.5	101±4.6	1.2±0.046	14±0.48	5,292±352	1.91±0.050	2.46±0.069	15±0.52	58±4.5
Girls 7- 8	2,360±55	79±2.2	96±3.7	1.2±0.052	12±0.39	5,206±322	1.50±0.040	2.45±0.071	12±0.40	58±3.4
9-11	2,317±53	75±2.0	94±3.6	1.2±0.041	12±0.38	4,906±327	1.47±0.039	2.27±0.058	13±0.40	58±3.7
12-14	2,299±49	73±1.6	93±3.3	1.2±0.038	12±0.37	4,600±316	1.45±0.041	2.14±0.051	13±0.40	57±4.0
Period 2—Spring										
Boys 7- 8	2,448±59	82±2.5	90±4.6	1.3±0.057	12±0.46	5,138±387	1.57±0.048	2.48±0.076	14±0.51	63±5.0
9-11	2,606±59	86±2.4	108±4.7	1.3±0.045	14±0.45	5,580±521	1.69±0.052	2.51±0.068	15±0.49	75±4.2
12-14	2,663±60	86±2.4	113±4.9	1.3±0.040	14±0.47	5,371±452	1.74±0.515	2.56±0.065	15±0.61	76±4.5
Girls 7- 8	2,074±52	79±2.2	98±4.0	1.3±0.045	12±0.41	5,712±602	1.49±0.043	2.52±0.067	12±0.40	59±3.2
9-11	2,333±54	77±2.0	99±4.1	1.2±0.042	12±0.39	5,420±540	1.48±0.045	2.33±0.060	13±0.44	59±3.3
12-14	2,262±56	72±1.9	96±4.3	1.2±0.036	11±0.43	5,011±659	1.44±0.047	2.17±0.058	13±0.52	58±3.8
Year 2										
Period 1—Fall										
Boys 7- 8	2,414±57	83±2.3	99±4.9	1.3±0.052	13±0.50	6,033±895	1.64±0.059	2.57±0.081	14±0.50	67±4.6
9-11	2,428±69	86±4.0	104±5.3	1.2±0.055	14±0.47	5,833±682	1.71±0.053	2.48±0.079	14±0.44	68±5.0
12-14	2,572±80	84±3.2	106±6.4	1.2±0.043	14±0.58	6,210±771	1.74±0.065	2.48±0.078	15±0.52	68±5.6
Girls 7- 8	2,206±56	74±2.5	91±4.4	1.3±0.050	12±0.11	5,346±597	1.48±0.048	2.34±0.081	12±0.33	64±4.1
9-11	2,194±57	72±2.0	91±4.4	1.2±0.040	12±0.36	5,029±623	1.49±0.053	2.24±0.064	12±0.36	61±4.4
12-14	2,078±60	68±2.4	86±4.3	1.0±0.037	12±0.43	4,378±407	1.43±0.062	2.01±0.071	12±0.57	59±4.5
Period 2—Spring										
Boys 7- 8	2,444±65	85±2.8	94±4.6	1.4±0.062	13±0.46	6,047±986	1.57±0.056	2.36±0.113	14±0.54	59±5.5
9-11	2,679±76	90±3.5	104±4.4	1.4±0.061	14±0.58	5,893±910	1.74±0.087	2.68±0.124	15±0.77	59±4.7
12-14	2,579±82	87±3.6	100±5.1	1.2±0.058	14±0.60	5,616±937	1.74±0.093	2.58±0.107	15±0.78	54±4.6
Girls 7- 8	2,264±64	79±2.7	86±4.1	1.3±0.060	12±0.40	5,254±913	1.43±0.049	2.48±0.103	11±0.52	56±3.2
9-11	2,295±57	81±3.6	87±3.4	1.3±0.046	13±0.44	5,021±696	1.51±0.060	2.36±0.089	13±0.57	58±3.4
12-14	2,248±75	75±3.1	91±4.6	1.2±0.050	12±0.16	4,712±555	1.48±0.020	2.17±0.086	13±0.68	54±4.1

Table 3. Per Cent Calories Derived from the Three Organic Nutrients

	1959-60 Both Periods								1960-61 Both Periods							
	Total Calories		Pro. Cal. % Total		Fat Cal. % Total		Car. Cal. % Total		Total Calories		Pro. Cal. % Total		Fat Cal. % Total		Car. Cal. % Total	
7- 8 School	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
1	2,811	2,478	14	14	40	41	46	45	2,824	2,526	15	15	45	43	40	42
2	2,560	2,468	14	14	37	37	49	49	2,456	1,996	14	13	36	37	50	50
3	2,187	2,374	13	14	31	33	56	53	2,363	2,292	13	14	34	34	53	52
4	2,628	2,582	13	13	41	42	46	45	2,265	2,331	14	14	36	37	50	49
5	2,159	2,080	13	13	43	40	47	47	2,538	2,486	13	14	42	41	45	45
6	2,525	2,344	13	13	35	34	53	52	2,484	2,255	14	14	33	33	53	53
7	2,274	2,105	13	13	24	26	63	61	2,419	1,988	12	12	25	26	63	62
8	2,494	2,340	12	12	42	41	46	47	2,084	2,050	14	14	34	34	52	52
Mean	2,455	2,658	13	13	37	37	51	50	2,429	2,240	14	14	34	36	51	51
9-11 School																
1	2,890	2,404	14	14	40	40	46	46	3,036	2,287	14	13	44	43	42	44
2	2,783	2,541	12	13	38	37	50	50	2,640	2,216	13	14	36	36	51	50
3	2,315	2,060	13	13	31	33	56	54	2,416	2,216	15	14	33	32	52	54
4	2,794	2,464	13	13	43	44	44	43	2,521	2,264	13	14	34	37	53	49
5	2,449	2,191	13	13	39	39	48	48	2,640	2,374	13	14	44	41	43	45
6	2,595	2,525	13	13	35	36	52	51	2,546	2,342	13	13	34	35	53	52
7	2,546	2,057	13	13	25	26	62	61	2,478	2,146	12	12	26	26	62	62
8	2,468	2,354	12	12	40	39	48	49	2,582	2,107	15	15	33	34	52	51
Mean	2,580	2,324	13	13	36	37	51	50	2,607	2,224	14	14	34	34	51	51
12-14 School																
1	2,908	2,188	13	13	39	39	48	48	3,156	2,382	14	20	45	44	41	36
2	2,641	2,506	13	13	37	38	50	49	2,715	2,430	13	13	36	36	51	51
3	2,333	2,007	13	14	31	35.	56	51	2,266	1,907	13	13	33	34	54	53
4	2,843	2,634	13	13	44	43	43	44	2,482	2,456	13	13	35	36	52	51
5	2,364	2,132	13	13	40	39	47	48	2,736	2,162	13	13	41	46	46	41
6	2,395	2,226	13	12	36	36	51	52	2,275	2,098	13	13	33	35	54	52
7	2,501	2,150	13	13	27	27	60	60	2,410	1,964	12	12	27	27	61	61
8	2,846	2,262	12	12	41	41	47	47	2,566	1,902	15	15	34	34	51	51
Mean	2,604	2,263	13	13	37	37	50	50	2,576	2,163	13	14	36	36	51	50

Table 4. Mean Nutritive Values of Diets — Analyzed. (Fall of 1959 and Winter of 1960)

	Protein gm.		Fat gm.		Calories*		Calcium gm.		Phosphorus gm.		
	B	G	B	G	B	G	B	G	B	G	
7- 8											
School 1	101	103	116	117	2,828	2,871	2.6	2.1	2.3	2.0	
2	90	87	95	93	2,483	2,467	1.7	1.6	1.8	1.7	
3	58	74	48	52	1,644	2,041	1.9	—	1.7	—	
4	89	85	64	59	2,460	2,339	1.5	1.5	1.4	1.4	
5	80	74	84	81	2,311	2,186	1.5	1.5	1.6	1.5	
6	84	90	51	60	2,214	2,192	2.5	2.4	2.2	2.1	
7	76	76	48	50	2,551	2,008	1.0	1.0	1.6	1.6	
8	76	78	78	88	2,177	2,153	1.9	1.7	1.9	1.6	
Mean	82	83	73	75	2,334	2,282	(2.2	2.1	2.0	1.9	Experimental School†
							(1.4	1.4	1.6	1.6	Control School
9-11											
School 1	101	91	118	109	2,913	2,672	2.2	2.0	2.3	1.8	
2	99	79	112	83	2,814	2,274	1.8	1.8	1.9	1.8	
3	56	69	47	56	1,566	1,896	2.1	2.0	2.3	2.0	
4	88	84	46	41	2,414	2,276	1.6	1.3	1.9	1.7	
5	84	87	89	91	2,542	2,545	1.4	1.3	1.7	1.5	
6	87	86	63	55	2,323	2,093	2.6	2.4	2.3	2.0	
7	78	68	57	50	2,284	2,004	1.0	1.0	1.8	1.4	
8	90	80	80	84	2,522	2,229	1.9	1.6	1.9	1.6	
Mean	85	80	76	71	2,422	2,249	(2.2	2.0	2.1	1.8	Experimental School†
							(1.4	1.4	1.8	1.6	Control School
12-14											
School 1	110	83	118	100	3,087	2,421	2.3	1.5	2.1	1.5	
2	97	86	103	84	2,576	2,386	1.7	1.6	2.0	1.6	
3	79	66	60	50	1,880	1,784	2.1	1.8	1.9	1.6	
4	90	81	59	51	2,625	2,252	1.6	1.4	1.8	1.6	
5	93	80	97	79	2,770	2,246	1.4	1.2	1.6	1.4	
6	76	75	58	40	2,078	1,998	2.6	2.0	2.2	1.8	
7	85	62	66	53	2,354	2,026	1.2	0.9	1.7	1.3	
8	102	78	113	91	2,927	2,303	2.1	1.6	2.2	1.6	
Mean	92	76	84	68	2,537	2,177	(2.2	1.7	2.1	1.6	Experimental School†
							(1.5	1.2	1.8	1.5	Control School

*Fat x 9 plus (dry matter-ash-fat) x 4.
†Reflects values of the di-calcium phosphate incorporated in the bread for the experimental schools (1, 3, 6, 8).

Table 5. Per cent of NRC Allowance. (Based on means of 4 observations)

	Calories		Protein gm.		Calcium gm.		Iron mg.		Vitamin A I.U.		Thiamine mg.		Riboflavin mg.		Niacin* mg.		Asc. A. mg.	
	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
Age 7- 8																		
School 1	134	119	172	150	190	160	130	120	212	184	146	127	213	187	100	93	133	117
2	120	106	143	125	120	110	140	120	181	157	145	127	160	140	100	86	123	100
3	108	110	126	136	130	140	120	111	102	119	127	136	173	167	86	86	87	90
4	112	112	137	140	140	140	130	130	137	129	154	154	184	189	81	81	98	100
5	111	109	133	128	150	140	100	100	197	182	118	118	187	173	86	79	102	95
6	119	109	140	130	140	130	130	120	122	109	145	127	180	160	100	86	78	75
7	112	97	125	110	90	90	140	130	170	163	173	145	140	133	114	93	82	73
8	109	104	128	122	120	120	130	130	169	159	154	145	153	153	100	93	130	123
Age 9-11																		
School 1	118	94	146	115	125	100	125	100	169	124	123	100	161	128	94	76	111	91
2	108	95	131	114	108	100	117	100	142	108	136	146	139	128	88	76	101	180
3	95	86	118	103	100	100	100	92	82	84	115	108	122	122	76	71	72	67
4	106	94	123	113	125	117	117	100	96	94	138	123	156	144	82	70	80	73
5	102	91	121	107	117	100	100	92	165	142	108	100	161	128	82	70	87	79
6	103	97	120	113	108	100	117	100	89	85	131	115	150	139	82	82	59	61
7	96	84	110	94	75	75	125	108	135	143	146	130	115	111	94	82	61	61
8	101	89	121	106	108	90	125	108	127	117	154	131	150	153	82	82	108	99
Age 12-14																		
School 1	90	88	124	98	114	85	100	80	143	103	106	100	143	115	81	76	92	88
2	90	95	111	102	93	85	93	87	55	95	113	131	124	115	76	82	80	82
3	74	76	89	82	86	77	80	67	69	73	88	92	105	95	62	65	53	58
4	86	97	99	101	100	100	93	93	80	94	112	130	127	129	67	82	60	81
5	84	82	99	86	86	77	90	67	142	103	88	92	119	105	67	65	69	65
6	71	83	87	86	86	77	80	73	69	63	94	100	114	110	57	65	42	45
7	79	79	92	79	64	53	100	87	134	137	120	115	105	90	76	82	56	44
8	87	80	107	85	93	77	107	87	123	88	135	123	129	100	86	82	100	78

*%Niacin equivalent.

Table 6. Mean Daily Nutritive Values per Child Based on Inventories

Period	Calories		Protein gm.		Fat gm.		Calcium gm.		Iron mg.		Vitamin A I.U.		Thiamine mg.		Riboflavin mg.		Niacin mg.		Asc. A. mg.	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
1959-60																				
School 1	3,110	3,513	107	131	165	157	1.3	1.8	16	20	6,240	6,210	1.71	2.52	2.63	3.71	21	24	83	76
2	3,744	2,956	116	102	146	117	1.5	1.4	20	18	10,111	7,300	2.31	1.84	3.07	2.70	20	18	125	113
3	2,160	2,222	69	75	84	76	0.9	1.1	11	13	4,560	3,960	1.27	1.56	1.93	2.16	12	13	48	52
4	2,521	2,729	89	81	100	119	1.8	1.3	12	14	5,830	4,620	1.59	1.71	3.04	2.39	13	14	57	80
5	4,153	2,858	130	93	182	110	2.4	1.4	19	18	9,340	6,440	2.39	1.75	4.40	2.84	19	17	85	86
6	4,303	3,178	125	102	100	125	1.2	1.5	13	17	4,440	4,100	1.83	2.73	2.55	3.35	14	20	31	48
7	2,517	2,927	89	104	78	75	1.0	1.2	15	20	5,480	10,610	2.02	2.65	2.42	3.30	16	24	35	62
8	3,353	3,460	105	122	162	158	1.2	1.4	21	23	7,490	7,330	2.60	2.92	2.84	3.26	24	25	87	96
1960-61																				
School 1	3,171	2,635	108	92	152	113	1.3	1.2	18	14	8,690	8,640	2.39	1.69	3.08	2.42	20	14	82	63
2	2,986	2,807	100	104	131	106	1.3	1.0	17	19	8,420	5,460	1.94	1.88	2.70	2.36	17	20	78	82
3	2,399	2,332	83	67	79	92	1.1	0.7	14	13	4,430	3,640	1.62	1.38	2.35	1.77	15	13	57	57
4	1,983	2,100	74	75	80	81	1.4	1.3	12	11	3,410	3,560	1.24	1.06	2.79	2.21	11	10	60	73
5	3,053	2,891	94	100	139	120	1.3	1.2	15	17	5,920	18,710	1.66	1.49	2.51	3.22	17	18	66	55
6	1,464	2,172	43	73	65	100	0.5	1.3	9	11	4,100	4,060	0.68	1.13	1.03	2.30	7	10	48	50
7	2,768	2,426	86	84	90	71	1.0	1.0	18	16	10,810	3,580	2.20	1.82	2.72	2.37	19	16	77	43
8	2,299	2,928	84	86	99	140	1.0	1.1	16	16	3,910	5,510	1.73	2.15	2.28	2.47	17	18	85	46

Table 7.—Mean Nutritive Values of Diets of Bureau of Indian Affairs and Mission Schools (All 4 periods)

Ages:	7-8				9-11				12-14			
	BIA		M		BIA		M		BIA		M	
	B	G	B	G	B	G	B	G	B	G	B	G
Calories	2,491	2,308	2,393	2,300	2,686	2,310	2,502	2,259	2,720	2,248	2,438	2,187
Protein—gm.	86	79	79	78	91	78	82	74	94	75	88	70
Fat—gm.	110	101	87	86	116	100	92	85	121	98	90	84
Calcium—gm.	1.4	1.3	1.2	1.2	1.4	1.2	1.2	1.2	1.4	1.0	1.2	1.0
Iron—gm.	12	12	13	12	14	12	14	12	14	12	13	12
Vitamin A I.U.÷1,000	6.6	6.0	4.7	4.8	6.8	5.6	4.5	4.6	5.8	4.9	4.9	4.4
Asc. Acid—mg.	73	65	52	51	76	65	51	50	77	62	48	48
Thiamine—mg.	1.5	1.4	1.6	1.3	1.7	1.6	1.8	1.3	1.8	1.4	1.6	1.4
Riboflavin—mg.	2.7	2.4	2.6	2.4	2.8	2.3	2.4	2.4	2.7	2.2	2.4	2.1
Niacin—mg.	14	12	15	12	15	13	15	14	16	13	14	12

BIA—Bureau of Indian Affairs; M—Mission Schools.

Table 8: Mean Heights and Weights of Adolescent Girls for Three Successive Periods (8 Schools)

Period	Age	No. subjects	Height ins.	Height Range	Weight lbs.	Weight Range
Spring						
1959	12	94	56.0	52 -57.5	80.0	75.7- 85
	13	92	58.4	57 -59.2	90.5	87 - 93.5
	14	71	60.5	59.7-62.5	108.0	97.0-111.0
Fall						
1959	12	126	57.4	56 -58.5	85.5	83.7- 89.5
	13	112	60.0	59 -60.7	98.5	92.5-108.5
	14	97	61.4	60.5-62.5	109.0	102.5-112
Winter						
1960	12	120	58.0	57.7-59.0	89.0	83 - 94.5
	13	113	60.2	59.5-61.5	101.0	94.0-107.0
	14	114	62.0	61 -62.5	110.5	100.0-117.5

Table 9. Mean Heights and Weights at Winter Measure Compared with Meredith Growth Norms for Nearest Age, 8 Schools

Age yrs.	No. girls	Height ins.	Meredith percentiles	Weight lbs.	Meredith percentiles
12	120	57.7	25th	88.9	52nd
13	113	60.4	27th	100.8	52nd
14	114	61.7	25th	110.5	53rd

Table 10. Mean Heights and Weights by Age at Menarche, and Comparison of Winter Measures with Meredith Growth Norms for Age 13

Age at Menarche	No.	Ht. ins.	Percentile	Wt. lbs.	Percentile
Before 11 yr. 6 mo.	5	61.9	50th	119.0	83rd
11 yr. 6 mo. 12 yr. 6 mo.	32	61.3	40th	114.9	78th
12 yr. 7 mo. 13 yr. 6 mo.	36	61.7	45th	111.6	74th
13 yr. 7 mo. 14 yr. 6 mo.	13	60.9	33rd	98.6	47th
Menarche not yet reached	64	58.8	12th	89.2	26th

Table 11. Mean Hemoglobin Levels by Schools and Age Groups, 4 Schools

School	Age yrs.	Fall 1959 No. girls	Fall 1959 Hemoglobin gm. %	Spring 1960 No. girls	Spring 1960 Hemoglobin gm. %
5	12	7	11.7	6	12.2
	13	2	11.8	2	12.2
	14	2	10.8	2	11.7
6	12	10	11.1	7	11.6
	13	12	11.3	9	12.0
	14	2	11.6	2	10.6
7	12	3	12.3	3	12.3
	13	17	11.5	13	12.5
	14	1	11.0	1	12.6
8	12	2	12.7	1	10.7
	13	11	11.2	9	11.4
	14	4	12.2	3	10.5
All schools	12	22	12.0±0.93	17	11.7±0.774
	13	42	11.4±1.249	33	12.0±1.222
	14	9	11.6±0.82	8	11.4±1.679
All schools	All ages	73	11.6±1.086	58	11.7±2.105

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APPENDIX

Forms Used in Collection of Dietary Data

Menu

School.....

Date.....

Breakfast
Dinner
Luncheon
Supper
Snack

Morning
Noon
Evening
Between Meal
Morning
Afternoon
Evening

Boarders

Elem. Girls.....
Elem. Boys.....
Total.....
H.S. Girls.....
H.S.Boys.....
Total.....

Day

Elem. Girls.....
Elem. Boys.....
Total.....
H.S. Girls.....
H.S.Boys.....
Total.....

Adults

Men.....
Women.....
Total.....

DIETARY OBSERVATIONS

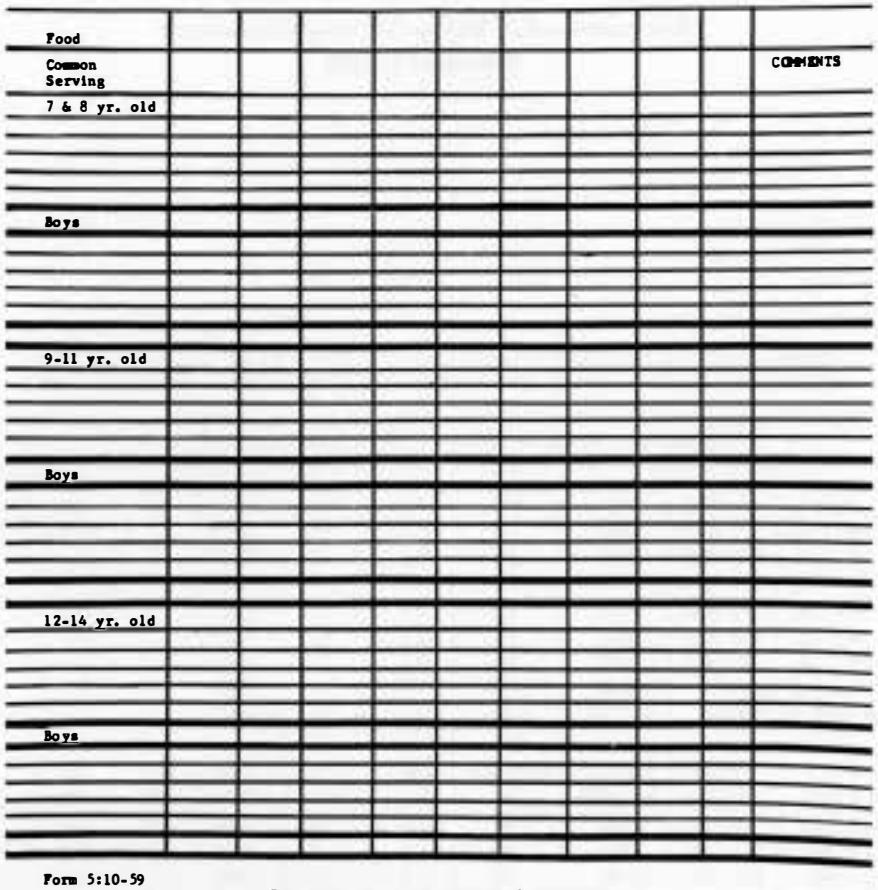
Date ..... Meal..... School .....

Item	6 yr.		7-8 yr.		9-11 yr.		12-14 yr.	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
	Av. Sv.	Av. Sv.	Av. Sv.	Av. Sv.	Av. Sv.	Av. Sv.	Av. Sv.	Av. Sv.

Form 7:1-60

Dietary Observations

Date _____ Meal _____ School _____



Form 5:10-59

Form used to record individual interviews.

TOTAL FOOD PREPARATION

Date..... Meal..... School .....

Item	Weight Food Container	Weight Container	Weight or Qty.Food Served	Leftover	Wt. or Qty. Food used

Form 4:1-60

Recommended Daily Dietary Allowance
(Revised 1958)

FOOD AND NUTRITION BOARD, NATIONAL RESEARCH COUNCIL
RECOMMENDED DAILY DIETARY ALLOWANCES[1], REVISED 1958

DESIGNED FOR THE MAINTENANCE OF GOOD NUTRITION OF HEALTHY PERSONS IN THE U.S.A.

(Allowances are intended for persons normally active in a temperate climate)

	Age Years	Weight kg. (lb.)	Height cm. (in.)	Calories	Protein gm.	Calcium gm.	Iron mg.	Vitamin A I.U.	Thiam. mg.	Ribo. mg.	Niacin[2] mg. equiv.	Asc. Acid mg.	Vitamin D I.U.
Men	25	70 (154)	175 (69)	3200[3]	70	0.8	10	5000	1.6	1.8	21	75	
	45	70 (154)	175 (69)	3000	70	0.8	10	5000	1.5	1.8	20	75	
	65	70 (154)	175 (69)	2550	70	0.8	10	5000	1.3	1.8	18	75	
Women ..	25	58 (128)	163 (64)	2300	58	0.8	12	5000	1.2	1.5	17	70	
	45	58 (128)	163 (64)	2200	58	0.8	12	5000	1.1	1.5	17	70	
	65	58 (128)	163 (64)	1800	58	0.8	12	5000	1.0	1.5	17	70	
	Pregnant (second half)			+300	+20	1.5	15	6000	1.3	2.0	+3	100	400
	Lactating (850 ml. daily)			+1000	+40	2.0	15	8000	1.7	2.5	+2	150	400
Infants[4] ..	0-1/12[4]				See								
	2/12-6/12	6 (13)	60 (24)	kg.x120	Footnote	0.6	5	1500	0.4	0.5	6	30	400
	7/12-12/12	9 (20)	70 (28)	kg.x100	4	0.8	7	1500	0.5	0.8	7	30	400
Children .	1 - 3	12 (27)	87 (34)	1300	40	1.0	7	2000	0.7	1.0	8	35	400
	4 - 6	18 (40)	109 (43)	1700	50	1.0	8	2500	0.9	1.3	11	50	400
	7 - 9	27 (60)	129 (51)	2100	60	1.0	10	3500	1.1	1.5	14	60	400
	10-12	36 (79)	144 (57)	2500	70	1.2	12	4500	1.3	1.8	17	75	400
Boys.....	13-15	49 (108)	163 (64)	3100	85	1.4	15	5000	1.6	2.1	21	90	400
	16-19	63 (139)	175 (69)	3600	100	1.4	15	5000	1.8	2.5	25	100	400
Girls.....	13-15	49 (108)	160 (63)	2600	80	1.3	15	5000	1.3	2.0	17	80	400
	16-19	54 (120)	162 (64)	2400	75	1.3	15	5000	1.2	1.9	16	80	400

[1] The allowance levels are intended to cover individual variations among most normal persons as they live in the United States under usual environmental stresses. The recommended allowances can be attained with a variety of common foods, providing other nutrients for which human requirements have been less well defined. See text for more detailed discussion of allowances and of nutrients not tabulated.

[2] Niacin equivalents include dietary sources of the preformed vitamin and the precursor, tryptophan. 60 milligrams tryptophan equals 1 milligram niacin.

[3] Calorie allowances apply to individuals usually engaged in moderate physical activity (page 2). For office workers or others in sedentary occupations they are excessive. Adjustments must be made for variations in body size, age, physical activity, and environmental temperature.

[4] See text for discussion of infant allowances. The Board recognizes that human milk is the natural food for infants and feels that breast feeding is the best and desired procedure for meeting nutrient requirements in the first months of life. No allowances are stated for the first month of life. Breast feeding is particularly indicated during the first month when infants show handicaps in homeostasis due to different rates of maturation of digestive, excretory, and endocrine functions. Recommendations as listed pertain to nutrient intake as afforded by cow's milk formulas and supplementary foods given the infant when breast feeding is terminated. Allowances are not given for protein during infancy.

From: National Academy of Sciences, National Research Council, Publication 589.

Detailed Results of Analysis of Variance

Statistical Data — Analysis of Variance

Source of variation	Degrees of freedom	MS Calories	"F"		MS Protein	"F"		MS Fat	"F"		MS Calcium (X 10^{-2})	"F"		MS Iron	"F"	
T	1	790,749	—	*	2,433.49	—	*	20,063.8	—	*	63.3814	—	*	1.57170	—	*
R/T	6	493,751	2.18	*	871.57	3.45	§	5,896.0	2.60	*	95.0049	5.82	†	34.51314	8.67	‡
Y	1	164,012	—	*	24.25	—	*	1,289.8	—	*	15.8535	—	*	5.66207	1.42	*
YT	1	32,321	—	*	466.43	1.84	*	657.4	—	*	0.0434	—	*	0.07784	—	*
YR/T	6	226,608	8.34	‡	252.56	5.62	‡	2,270.4	26.07	‡	16.3121	14.85	‡	3.98020	2.76	†
S	1	3,787,309	28.73	‡	4,505.24	29.91	‡	5,257.6	28.78	†	83.1004	30.00	†	119.25007	42.59	†
ST	1	356,003	4.45	§	528.20	4.30	§	1,587.8	8.69	†	29.0296	10.68	†	5.62288	2.58	*
SR/T	6	79,987	2.94	‡	122.67	2.73	†	182.67	2.09	†	2.7172	2.47	†	2.18053	1.51	*
SY	1	79,008	2.91	‡	72.94	1.62	*	76.6	—	*	1.1541	1.05	*	2.05959	1.43	*
P	1	121,557	—	*	363.00	—	*	51.9	—	*	5.9905	—	*	1.44015	—	*
PT	1	35,896	—	*	33.00	—	*	1,894.9	—	*	8.8041	—	*	0.07048	—	*
PR/T	6	80,215	2.95	‡	147.48	3.28	‡	465.3	—	*	10.1828	9.27	‡	7.72891	5.35	‡
PY	1	56,834	2.09	*	130.02	2.89	§	688.2	—	*	2.6336	2.40	*	0.17349	—	*
PS	1	473	—	*	16.63	—	*	5.3	—	*	0.0523	—	*	0.01966	—	*
A	2	99,575	—	*	128.80	—	*	148.5	—	*	44.5543	5.92	†	8.12520	4.69	‡
AT	2	78,325	1.51	*	111.53	1.51	*	81.36	—	*	0.2331	—	*	6.77406	7.13	‡
AR/T	12	51,813	1.91	†	73.57	1.64	§	104.0	—	*	7.5284	6.86	‡	0.94965	—	*
AY	2	10,627	—	*	28.98	—	*	0.1	—	*	0.3636	—	*	0.28866	—	*
AS	2	243,883	8.98	‡	307.27	6.83	‡	362.32	4.16	†	11.1670	10.17	‡	4.89107	3.39	†
AP	2	13,902	—	*	11.71	—	*	43.4	—	*	0.0786	—	*	0.26718	—	*
AST	2	42,896	1.58	*	57.48	1.28	*	63.4	—	*	0.0458	—	*	2.67095	1.85	*
Other interactions	133	27,663	—	*	41.15	—	*	70.6	—	*	1.0546	—	*	1.24100	—	*
Residual	960	27,165	—		44.97	—		87.1	—		1.0981	—		1.44285	—	
¶YPT	1	—	—		—	—		4,940.71	56.7	‡						
YPR/T	6	—	—		—	—		864.7	9.93	‡						

Source of variation	Degrees of freedom	Vitamin A MS	F		Log Vitamin A MS	F		Thiamine MS (X 10^{-4})	F		Log Thiamine MS	F	
T	1	107,373,950	4.57	§	6.2667	13.59	†	1,252	—	*	0.10714	—	*
R/T	6	23,462,406	—	*	0.4611	1.56	*	8,482	36.20	‡	0.36269	50.60	‡
Y	1	1,492,476	—	*	0.0227	—	*	314	1.33	*	0.00585	—	*
YT	1	2,662,920	—	*	0.0345	—	*	6,509	27.70	‡	0.21652	29.80	‡
YR/T	6	13,113,696	5.07	‡	0.2946	7.06	‡	234	1.37	*	0.00726	—	*
S	1	14,675,904	—	*	0.3400	8.15	‡	18,423	42.89	‡	0.73089	42.89	‡
ST	1	19,193,754	7.44	‡	0.4827	11.57	‡	965	1.97	*	0.03922	2.44	*
SR/T	6	652,579	—	*	0.0172	—	*	490	2.85	‡	0.01604	2.54	†
SY	1	4,929,701	1.91	*	0.0219	—	*	209	1.21	*	0.00728	—	*
P	1	918,947	—	*	0.0302	—	*	42	—	*	0.00001	—	*
PT	1	3,132,859	—	*	0.0040	—	*	16	—	*	0.00287	—	*
PR/T	6	6,635,459	2.57	†	0.1201	2.88	‡	812	4.72	‡	0.02672	4.23	‡
PY	1	479,899	—	*	0.0542	1.30	*	28	—	*	0.00121	—	*
PS	1	644,109	—	*	0.0032	—	*	23	—	*	0.00019	—	*
A	2	3,085,689	—	*	0.1282	3.07	†	814	3.23	§	0.02488	—	*
AT	2	621,381	—	*	0.0059	—	*	1,233	4.88	†	0.04860	4.63	†
AR/T	12	466,490	—	*	0.0148	—	*	252	1.47	*	0.01050	1.66	§
AY	2	443,970	—	*	0.0068	—	*	54	—	*	0.00174	—	*
AS	2	1,140,787	—	*	0.0534	1.28	*	940	5.47	‡	0.03801	6.02	‡
AP	2	94,219	—	*	0.0012	—	*	181	—	*	0.00575	—	*
AST	2	940,410	—	*	0.0228	—	*	136	—	*	0.00336	—	*
Other interactions	133	1,993,683	—	*	—	—		164	—	*	—	—	
Residual	960	2,584,750	—		0.041686	—		171.7977	—		0.0063148	—	

Source of variation	Degrees of freedom	Riboflavin MS (X 10^{-4})	F		Niacin MS	F		Ascorbic Acid MS	F		Log Ascorbic Acid MS	F	
T	1	8,712	—	*	15.04	—	*	19,021	5.87	§	4.778	—	§
R/T	6	14,677	5.66	†	39.64	9.30	†	1,315	2.57	*	0.420	2.84	*
Y	1	60	—	*	1.15	—	*	72	—	*	0.043	—	*
YT	1	1,698	—	*	28.10	6.59	†	1,411	2.76	*	0.418	2.82	*
YR/T	6	2,593	7.46	†	4.26	2.20	†	512	4.00	‡	0.148	5.04	‡
S	1	34,900	25.20	‡	127.07	35.00	‡	1,646	12.88	‡	0.293	9.98	‡
ST	1	8,180	8.09	†	11.51	—	*	1,245	9.80	‡	0.235	7.99	‡
SR/T	6	1,010	2.90	‡	3.58	1.84	§	34	—	*	0.008	—	*
SY	1	723	2.10	*	0.54	—	*	91	—	*	0.033	—	*
P	1	3,878	—	*	10.28	—	*	217	—	*	0.025	—	*
PT	1	2,110	—	*	0.03	—	*	1,141	2.80	*	0.396	4.48	§
PR/T	6	1,786	5.13	‡	5.19	2.68	†	407	3.19	‡	0.089	3.01	‡
PY	1	843	2.42	*	2.00	—	*	1,531	11.98	‡	0.514	17.54	‡
PS	1	21	—	*	0.15	—	*	19	—	*	0.007	—	*
A	2	4,785	—	*	16.79	8.60	‡	39	—	*	0.036	—	*
AT	2	314	—	*	11.29	5.83	‡	94	—	*	0.034	—	*
AR/T	12	1,716	4.94	‡	1.14	—	*	41	—	*	0.014	—	*
AY	2	203	—	*	0.04	—	*	61	—	*	0.031	—	*
AS	2	3,261	9.37	‡	6.59	3.40	†	42	—	*	0.027	—	*
AP	2	307	—	*	1.09	—	*	7	—	*	0.002	—	*
AST	2	130	—	*	2.22	1.14	*	85	—	*	0.019	—	*
Other interactions	133	383	—	*	1.48	—	*	54	—	*	—	—	
Residual	960	347.86	—		1.9378	—		127.83	—		0.02936	—	

*Not significant. †Significant P<.05. ‡Significant P<.01. §Significant P<.10. ¶These interactions were apparently the only ones of the higher order interactions which were significant. T=Type, R=School, Y=Year, S=Sex, P=Period, A=Age. (Analyses were made in the statistical laboratory of Iowa State University under direction of Dr. Donald K. Hotchkiss.)

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