

A STUDY OF THE DIETS OF CHILDREN RECEIVING FREE
^{1/}LUNCHES IN THREE RURAL SCHOOLS OF FAIRFAX
COUNTY, VIRGINIA IN ORDER TO DETERMINE
THE ADEQUACY OF THE SCHOOL
LUNCH PROGRAM

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Chapter I

INTRODUCTION

If the school lunch program is to make a vital contribution to the school nutrition program, it must be based on the nutritional needs of children and on the given school community. For some years, the number of applications for free or partially paid lunches has increased in the southwestern part of Fairfax County, Virginia; however, there was no available data on the eating habits of children in this school area. If the school is to fulfill its goal in providing adequate lunches so that all children may be adequately fed then the food needs of its population must be determined. This study was begun to determine the most common deficiencies in home diets and the food consumption of children that received free or partially paid lunches in three rural schools in Fairfax County. The results of this study should assist the local supervisors and school lunch managers in planning meals that will be acceptable, will supplement the home diet, will be based on the needs of the children, and will improve the status of under-privileged children.

It should afford a valuable aid to the classroom teacher in enabling her to have a better understanding of the children under her supervision.

Purpose

The purpose of this investigation was to study the diets of children receiving free lunches in three rural schools in Fairfax County, Virginia, in order to determine the adequacy of the school lunch program in these three schools.

The aims of this study were:

1. To determine the adequacy of the home diet and the variety of food consumed.
2. To evaluate the adequacy of the school lunch in relation to the home diet.
3. To study the relationship of the diet of free lunch children in regard to school attendance, academic achievement, social adjustment, and physical factors (such as weight, growth, and dental caries).
4. To ascertain the need of supplementing the school lunch to meet the needs of the individual school child.

Chapter II

REVIEW OF LITERATURE

Good health is an asset with which every child has a right to be endowed. Beeuwkee states: "Upon the health of the child depends his ability to use for his own betterment all the educational possibilities our school systems afford (1)".

Since poorly nourished children are not capable of properly benefiting from the public schools' educational program, it becomes the obligation of school boards to make provisions for proper school feeding (2,3).

The first record in the United States of lunches being provided for needy children of school age was done in New York in 1908 by a committee of educators, social workers and physicians. Forty-eight years later, Congress established the National School Lunch Act to safeguard the health and welfare of the nation's children. Ten years ago this act provided, what seemed to be, adequate nutritional standards, but due to the rapid growth of the school lunch program, too little emphasis has sometimes been placed on the actual nutrients the individual child is receiving (4,5).

In Virginia, a large percentage of all children are attending rural schools. Because of farm duties, long distances from school, early morning breakfast and physical activity, rural children require at least three adequate meals a day. However, figures obtained by Todhunter (6)

from studies made of rural children for seven consecutive days on meals missed reveal: one-seventh of the group missed supper at least once during the study. In the study of three day diets of elementary children in Hanover County, Virginia, (7), the subjects consumed less than two-thirds of the recommended servings of essential foods, except meat. A seven day study of 385 elementary children in Connecticut (8) revealed all but one of the diets to be poor in nutritional adequacy. Deficiencies were noted in whole grain cereals or enriched cereal products, green and yellow vegetables, foods high in Vitamin C and milk.

Morrison and McBryde (9) conducted a study of 1,222 elementary school children in Louisiana to determine what children ate, how well, and if it was a satisfactory diet. They found diets lacking most often in foods that supplied Vitamins A and C.

Investigators found in a study made of over 1,000 school children in Alabama, in which children from the third to sixth grades had been asked to keep diets for one week, that 10% of the group ate no food in the vitamin C group (10).

Warnick, et al, (11) studied seven-day food intakes of 274 Idaho school children and evaluated their diets in terms of the basic seven. The diets were low in citrus fruits and tomatoes, leafy green and yellow vegetables. Other studies and surveys (8,12) have, also, indicated that the elementary school age child is not meeting the requirements as recommended

by the Food and Nutrition Board of the National Research Council.

There is no period during an individual's life in which the diet is not of great importance. However, the protein-caloric intakes present a wide-spread problem. Protein is used for energy rather than tissue building when caloric intakes are inadequate, as in the diets of the children in this study, and thus growth can be limited (13).

One hundred children from 2½ - 15 years of age that were short in status for their ages were studied at Harvard Medical School and Massachusetts General Hospital. One half of these children had no apparent physical cause for their stunted growth. The protein intake was adequate but had been rendered inadequate by low caloric consumption by the subjects (13).

Growing children existing on low caloric food supplies need to have the caloric intake increased to meet the maintenance requirement and the additional food to rebuild the body tissues lost. When the caloric intake is low, care must be taken to see that all of the other nutrients are highly nutritious so that sufficient nutrients will be supplied to the growing child (14).

The average caloric consumption per capita per day has decreased approximately 260 calories from 1909-13 to 1955 according to studies made by the Department of Agriculture (15).

According to this report, the reduction of calories has been largely due to the decrease of flour, cereal products and potato consumption.

Children's energy needs are high and the calories listed as needed by the National Research Council for various ages are a first need for meeting the energy and growth requirements of active children. It is believed that a child with little adipose tissue is an easy victim to malnutrition (16).

The tendency for adolescent girls to curtail or fail to eat breakfast may be another reason for lowered caloric intake at this period. This reduces the total amount of nutrients for the day and children seldom eat enough at the other two meals. A bulletin of the Children's Bureau, states: "In order to meet heightened nutritional needs the protective foods that are also concentrated sources of energy should be eaten in liberal amounts (17)".

Poor dietary habits eventually retard the child's attitude and school progress. Potgieter and Everitt (8.), in a study of rural school children in Connecticut, found twice as high a percentage of socially maladjusted children in the poor diet group as in the better diet group. They also found that the poor diet group had greater school absenteeism due to illness. Fatigue, restlessness, and irritableness exhibited by malnourished children hindered the efficiency of the school work.

With elementary schools having the largest group of students at any level of education, it challenges school systems to assist in correcting poor dietary habits and thereby affecting the health of both the present and the next generation of citizens. This can be accomplished through the school lunch program (18).

It is highly desirable to study the dietary needs of pupils and the school community so that school lunches can be prepared that are nutritionally designed to compensate for deficiencies occurring in the diets of needy children (19). Todhunter states: "The lunch should be planned in relation to the other meals of the day and, insofar as it is possible, this mid-day meal should supply those foods which are not so likely to be obtained at the other meals (20)".

Although the Department of Agriculture sets nutritive standards (21) for the noon meal and reimburses schools for a small portion of the cost of food served, each school is free to plan menus to meet local food habits and dietary needs. For many children, the meal served at school may be the one good meal of the day. If this is evident from surveys, supplementary foods will need to be supplied during some portions of the school day. For where those responsible for planning school lunches have taken into consideration the child's other two meals, improvements in health have been noteworthy (22,23,24).

Since many children spend only a few years in the public school system, it must be remembered that these early years are formative ones where ideas, habits, and behavior patterns developed will influence the individual's entire life span.

Measuring Dietary Study

The problem of obtaining a reliable record of food intake of children is complicated. In working with elementary children, it seems an advisable procedure to record food in terms of measure rather than weight. Insofar as possible, both mother and child should be taught to keep an accurate record of everything eaten during the duration of the study. Criticisms have been made in regard to this method; however, when properly administered, this method has been of invaluable use in individual and group studies (25).

Measuring Length of Study

The length of period for food records to be kept is still being studied and evaluated. Trulson (26) found that when detailed interviews were had with subjects, that it produced more accurate information but recommended seven-day dietary records when this procedure was not possible. Young and associates (27) made an investigation of weekly variations in nutrient intake of young adults. They found

that there was need for a greater length of time. Many authorities feel that a seven-day dietary record is the shortest length of time that can be used from the standpoint of accuracy (28).

Measuring Seasonal Differences

Epprawright's (29) investigation of dietary data about children in midwestern states found no seasonal difference in the average nutrient intake. However, there was a noteworthy difference in the intake of protein, iron, and ascorbic acid. The latter was greater in the spring while the intake of protein was slightly higher in the fall. The study made in New York State (30) of fall and spring diets of school children showed a significant difference in vitamin A, in the seven to nine year old group, while protein and riboflavin varied with season for the 13 to 15 year age group.

Measuring Weekend Food Habits

Weekend food habits differed markedly from those of the five school days when Epprawright, et al, (29) studied children from Kansas, Ohio, and Iowa. In the account of Chalmers, (28) the junior high school children tended to eat well on Sundays as compared to Saturday.

Measuring Relationship of Diet and Dental Caries

There is still no sufficient experimental evidence of the relationship of eating habits on dental caries in humans (31). There are, however, investigators who support the idea that the teeth and the oral cavity are so intimately associated with food intake that it is often the first place where nutritional deficiencies can be observed. It is therefore assumed that these structures can be affected by nutrition. King states: "Diets of excellent quality, according to accepted standards among nutritional scientists, exert marked protection action against tooth decay (32)".

In a study made by Meyers (33) thirty-seven percent of 5,560 Alabama children in grades 5-12 reported they drank no milk. In the same study, boys averaged 3.2 glasses per day and the girls consumed 2.5 glasses per day.

Children's Bureau, Publication No. 22, (17), 1955, declares: "There is sufficient work of good caliber to indicate that attention to diet cannot only decrease the prevalence of caries but give some protection against further development of that already present". There is evidence that with the aid of a well-balanced diet supplemented by vitamin D and fluoridated water and a minimum of sticky high carbohydrate foods that are slow clearing the oral cavity, that this should lead to maintenance of good dental health (34).

Dr. Stearns (35) has stated that the calcium intake during childhood and adolescence is particularly important as girls marry at much earlier age than previously and many babies are born before the mother is out of her teens.

Measuring Growth

Heredity limits the final size of a child but achievement of this growth depends upon his environmental conditions. The latter, it is believed, is affected by nutrition (36).

Weight by itself cannot be used as an index of the physical fitness of the child. However, any change in weight which is 10% under or over the normal for the age and height cannot be disregarded in the young child at a period where the body should be growing actively. Wetzel's grid (37) is a device being used to determine whether growth is progressing satisfactorily and to what extent during the period of infancy to maturity.

In the study of nutritional status of children in Alabama (10), the special grids of Dr. Normal Wetzel were used to plot height and weight data of 860 children because it was believed to be a more reliable indication of the nutrition of the child than were height-weight tables. Davey and Todhunter (10) reported that: "Children who were rated as undernourished because they were underweight according to the tables were also undernourished according to the

Wetzel grid".

During World War II, when there was an equal distribution of food and an increase in purchasing power of the lower income groups in Scotland, boys and girls five to thirteen years of age in fairly representative samples showed substantial increase in height and weight (22).

Well organized, well planned school lunch programs have unlimited educational opportunities when correlated with the total school program. For a well balanced noon meal can assist toward the well-being of children whose home meals are deficient in substances essential to good nutrition and it cannot fail to be influential in the early establishment of desirable food habits (16).

Because a child's nutrition and health is of great concern to many, the Food and Nutrition Board of the National Research Council (38) has established dietary standards for the maintenance of optimum nutrition rather than minimal needs of any age group in the United States. In June, 1946, the National School Lunch Act (16,21) was adopted, making lunches at school available to children throughout the United States. Taylor and Macleod summarized the importance of this step by stating: "This is the most important practical step ever taken by our government to improve the health of all children through improvement in their nutrition (39).

Chapter III

PROCEDURE

The school lunch program in Fairfax County is the largest school feeding program in Virginia. Because the population has increased in the past ten years until it has become the fastest growing county in the United States, emphasis and time of the two local school lunch supervisors during the past six years have been utilized in planning and equipping fifty-eight new school lunch rooms, in training personnel to meet the standards of the National School Lunch Program, and in supervising the school lunch programs in the older established schools of the County. The school lunch supervisors have recognized that if the program is to take its rightful place in the educational program of Fairfax County, it is necessary to know the local food habits and dietary needs of the participants, particularly of those elementary children who cannot afford the cost of a school lunch.

The study was limited to white elementary students receiving partially paid or free lunches in three rural schools (Lorton, Fairview, and Centreville) located in the southwestern part of the county. Two of the schools had participated in the National School Lunch Program for four years and the other school for ten years. The school communities were similar as to size, socio-economic status of families and cultural background. Each school had a principal and a school lunch manager that was keenly interested in

the welfare of its student population.

In August, 1956, conferences were scheduled with visiting teachers, principals, teachers and school lunch managers in each school to review the purposes of the proposed study, to secure the co-operation of the respective school personnel and to collect pertinent information concerning children in the study.

Forms were prepared for keeping a record of the food and drink consumed each day. The form provided spaces for the name of each food and drink consumed, the quantity eaten, and whether the food was frozen, canned, or fresh. A space was provided for recording food eaten between regular meals and for vitamin supplements that might have been taken. Each paper provided a space for the pupil to record his name, date, day of week, and school that he attended. A copy of this schedule is included in the appendix.

Household measuring spoons and measuring cups were purchased to distribute to homes, where these were not available, to be used in measuring the amounts of food served to the child participating in the study.

Home visitation was necessary and important to explain the study to parents, to instruct and demonstrate to mothers the methods of measuring and recording food eaten by her school aged child. The investigator was accompanied to the homes of the free lunch children by either the visiting teacher or school lunch manager of the respective school community.

In the Fall of 1956, private interviews were held with each child being asked to participate in the study. At this contact, the purposes of the study were discussed and the pupil was instructed in ways of measuring and recording each day's diet.

Every family and child interviewed expressed willingness and interest in assisting with the study. When home visits were made, it was discovered that some children could not participate because of the parents lack of ability to read or write and because the child was too young to assume the responsibility of measuring and accurately recording the food eaten.

Each child was asked to participate in the study for fourteen consecutive days during November - December of 1956 and for seven consecutive days in April - May of 1957. The study was begun on Tuesday or Wednesday of the week so that parents and children would learn to keep the records without assistance by the end of the week.

During the study, the investigator visited the school daily during the lunch period to assist pupils in recording the food consumed at the school and to collect the record from the home of the food consumed the previous evening (supper) and at the breakfast of that particular day. This was done to insure an accurate record of the food eaten at the school and to eliminate any additional work for the classroom teacher.

Examinations of the mouth, teeth, and gums of each participant were made by the Fairfax County Health Department dentist. The records recorded are for two consecutive years.

Classroom teachers, principals and visiting teachers rated each child as to his adjustment and behavior into three categories: poor adjustment, average adjustment and superior adjustment.

Height and weight records were obtained from the accumulative health records in each school and were plotted on Wetzel-Grids.

Records of school attendance and academic achievement were obtained from the permanent record cards of each child.

Composition of Foods - Raw, Processed, Prepared, United States Department of Agriculture, Handbook No. 8 (40) was used in calculating the nutrients of the diet. Food Values of Portions Commonly Used, Eighth Edition (41), was used only when the food was not given in Handbook No. 8.

At the end of the Fall and Spring study, the dietary intakes were calculated for: Calories, protein, calcium, iron, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid. The results were tabulated and compared with the Recommended Daily Dietary Allowances (Revised, 1953) by National Research Council in an effort to determine the adequacy of the school lunch in relation to the other meals of the day and the needs of each participant.

The chi square test for goodness of fit (42) was used as a statistical tool in evaluating some of the data obtained.

Chapter IV

DISCUSSION OF RESULTS

Of the 32 children co-operating in this study, 14 were boys ranging in ages from 10 to 14 years and 18 were girls from 8 to 14 years of age.

Every child had attended the same school the previous school year and received free lunches both years.

Calories and nutrients obtained from the diet records were calculated using Handbook No. 8 (40). Data so calculated have been summarized in Table I. Of the 18 girls studied, a total of 5 failed to meet the National Research Council allowances (38) for all nutrients, no boy studied failed to meet the National Research Council allowances in all instances. Six boys and 6 girls met the National Research Council standards in only one nutrient. None of the subjects studied in the fall met the allowances for all nutrients. Only one girl and one boy in the spring dietary study met all nine of the nutrients studied.

In this study, the diet of a growing boy or girl has been classified as average, poor, very poor, and extremely poor.

The diet was classified as average, if seventy-five percent of the National Research Council allowances were met in nine nutrients; poor, if the diet met seventy-five percent of the allowances in at least eight nutrients;

TABLE I
CALCULATED MEAN NUTRIENT INTAKES OF SUBJECTS

Age Group	Sex	Season of Year	Number of Subjects	Calories Mean - Range	Protein Mean - Range gm.	Calcium Mean - Range mg.	Iron Mean - Range mg.	Vitamin A Mean - Range I.U.	Thiamine Mean - Range mg.	Riboflavin Mean - Range mg.	Niacin Mean - Range mg.	Ascorbic Acid Mean - Range mg.
7-9	Girls	Fall	6	1201 918-1506	44 35-63	.63 .43-.78	8 4-11	2160 1476-3819	.84 .50-1.14	1.42 .57-2.00	6.19 4.29-7.36	30 23.37
		Spring		1518 1247-1828	58 47-64	.88 .57-1.42	8 5-10	2161 1194-3140	.64 .57-.86	1.10 .86-1.57	9.14 7.43-13.57	43 25-84
10-12	Girls	Fall	7	1417 1061-1944	64 39-87	.95 .50-1.71	11 7-16	3144 1807-7047	1.19 .79-1.64	1.92 .86-4.36	9.32 5.00-15.64	30 21-44
		Spring		1552 1213-1761	64 48-77	1.04 .71-1.57	9 6-14	3507 2203-7579	.82 .43-1.14	1.08 .71-1.43	9.08 5.71-15.57	44 20-95
10-12	Boys	Fall	11	1645 1431-2139	73 56-101	.91 .57-1.36	11 8-14	3275 1726-6582	1.23 .78-2.28	2.01 1.36-2.71	10.40 7.64-13.78	31 20-46
		Spring		1677 1296-2337	74 61-107	.96 .57-1.57	10 4-20	3833 2252-8083	1.12 .57-2.00	1.48 .71-3.43	12.07 7.00-23.86	41 22-80
13-15	Girls	Fall	5	1457 1284-1777	59 44-73	.80 .57-1.21	10 6-17	2605 1893-3903	.97 .57-1.64	1.42 .57-2.30	8.20 6.43-11.29	23 17-35
		Spring		1567 1391-1861	73 60-74	.80 .43-1.00	10 8-13	2811 2576-3087	.94 .71-1.14	1.17 1.00-1.57	8.02 6.43-11.57	41 33-53
13-15	Boys	Fall	3	2314 2198-2392	105 95-117	1.21 .92-1.36	17 17-18	6330 5609-7303	1.83 1.57-2.21	3.16 2.21-4.14	20.30 19.42-20.93	43 27-57
		Spring		2475 2118-2823	98 90-106	1.51 1.04-2.10	16 13-19	4879 3557-5702	1.68 1.20-2.42	2.28 1.43-3.57	16.66 14.28-20.57	93 63-131

very poor, when less than 75% of the National Research Council allowance was met in four or more nutrients; extremely poor, if less than 75% of National Research Council allowance in more than 7 nutrients.

Calories

In the fall season, the total average daily caloric intake of the 6 girls, in age group 7 - 9 years, ranged from 918 - 1506. The National Research Council allowance for this group is placed at 2,000 calories. The highest caloric intake, 1506 calories, is only 75% of this allowance. The school lunch provided an average of approximately 1/2 of the calories received for the group. An average increase in caloric consumption of approximately 150 calories was noted in the diets in the spring.

The boys in the 10 - 12 year age group had greater intake of calories than did the girls of the same age. However, the 7 - 9 year old girls had higher mean caloric intake in the spring than the 10 - 12 year old girls had at either fall or spring seasons.

The adolescent girls, ages 13 - 15, consumed less calories than did the youngest subjects and received an average of only 62% of the 2500 calories recommended by the National Research Council (38). The average for the adolescent boys for both seasons was 75% of the requirements.

In the study of the nutritional status of a rural

community in South-Central New York State (43), the caloric intake for girls through adolescence was 400 - 700 calories below the National Research Council allowances. The results of the study reported here shows that for this group of adolescent girls, the average daily intake of calories was approximately a thousand calories low with a range of 1284 - 1561.

Protein

The National Research Council daily allowance for protein for children 7 - 9 years is 60 grams. Only one child in this age group met the allowance in the fall diet while the majority of girls met the standards in the spring diet. The school lunch supplied approximately 50% of the average daily protein intake for this group.

Compared to the younger group (7 - 9), the protein intake of the older subjects was greater, with the noon day meal at school supplying 41 - 52% of the allowances for the day. The protein intake of the adolescent boys exceeded the adolescent girls, although they too were fair.

The investigation made of pre-adolescent children in the Blacksburg, Virginia, school district for a six-day period of both the town and rural whites revealed that 100% or more of the allowances was met for protein (44).

Much of the protein intake of the 32 subjects on this study was: bologna, weiners, wild game, fresh water fish,

dried beans and pork.

Calcium

The National Research Council daily allowance for children 7 - 9 years of age is 1.0 gram of calcium per day. The daily calcium intake for this group ranged from .43 - .78 grams in the fall with the average daily calcium intake furnished by the school ranging from .13 - .47 grams daily. Two girls exceeded the standard in the spring diet, yet the daily mean for the group was .88 grams.

The calcium intake for the 10 - 12 year old girls was an improvement over the 7 - 9 year old girls in the fall and about the same for the spring. The girls in this age group exceeded the boys in the calcium consumption in both seasons. The calcium consumption of the adolescent girls was comparable to that of the 7 - 9 year olds with the school furnishing approximately 1/2 of the total intake.

The results of the study made by Meyer in Alabama (33) is comparable to that observed in this survey.

Iron

Girls in the 7 - 9 age group in the fall received 80% of the National Research Council allowance, 1/2 of which was furnished by the school lunch. The mean for both fall and spring seasons for these subjects was 78% with the lunch supplying more than 1/2 of this amount.

When diets of boys and girls are compared, those in the 10 - 12 year old group met more than 90% of the National Research Council allowances in the fall with slightly less than 1/2 of the requirement being furnished at the school. The mean was the same for both the boys and girls in the fall and spring study.

The girls age 13 - 15 were the lowest of any group of students studied, meeting approximately 2/3 of the National Research Council allowance and a little less than 1/2 being furnished by the noon meal at school. Boys within this same group were the only students that exceeded the National Research Council allowance in iron. It is significant that school lunch supplied approximately 1/2 of the iron furnished in the diet of all of the children studied, except the adolescent boys.

In a report (36) of food consumption in 1948 of families of both high and low income levels, the iron consumption of the high income group, when compared with the National Research Council allowances, was 88% and 86% in the low income group. The results compare with those of this study.

Vitamin A

The noon meal furnished by the school supplied more than 1/2 of the total National Research Council daily allowance of vitamin A for the 7 to 9 year old girls for both the fall and spring seasons.

The 10 to 12 year old girls met approximately $3/4$ of the National Research Council daily allowance for vitamin A in the spring with slightly less in the fall. The school lunch furnished an average of 46% of this amount for the two seasons studied. There was little difference in the diets of the boys in this same group except that the school lunch provided approximately $2/3$ of the allowance for vitamin A.

Girls from 13 to 15 years met a little more than $1/2$ of the National Research Council allowance in vitamin A with at least $2/3$ being furnished in the noon meal. The boys in this group exceeded the allowance for vitamin A with the school supplying $1/2$ of the amount.

The study made by Morrison and McBryde (9) of diets of elementary school children in Louisiana found them most often lacking in foods that supplied vitamins A and C. The lack of Vitamin A and C is evidenced in the survey of the diets of the 32 subjects studied. Of the vitamin A reported in the diets of all the children studied in both seasons of the year, it is noteworthy that $1/2$ to $2/3$ of the amount was provided by the one meal at school.

When observing diets of both boys and girls, the 10 to 12 year old girls met the National Research Council allowance in the fall but only $2/3$ of the requirement was met in the spring with $1/2$ of this amount being furnished by the school. This was evidenced in the diets of the boys within this same age group.

Thiamine

The diets of the girls 7 to 9 years were much higher in thiamine in the fall than in the spring, meeting 84% of the National Research Council allowance in the fall and decreasing to 64% in the spring. The lunch at school furnished a mean for both seasons of $1/3$ of the thiamine requirements.

When observing diets of both boys and girls, the 10 to 12 year old girls met the National Research Council allowances in the fall but only $2/3$ of the requirement was met in the spring with $1/2$ of this amount being furnished by the school. This was evidenced in the diets of the boys within this same age group.

Three-fourths of the National Research Council allowance for thiamine was met by the 13 to 15 year old girls with $1/2$ being furnished by the school. The diets were approximately the same in the spring. The boys, the same age, met the requirement in the fall but met only 69% of the National Research Council allowance in the spring with the school furnishing $1/2$ of this amount.

In each of the groups studied, there was a decrease in consumption of food supplying thiamine in the spring, probably due to a reduced intake of pork and dried beans.

Riboflavin

The diets of the youngest subjects studied met 94% of the National Research Council allowance in the fall with a

decline to 73% in the spring with approximately 1/2 of this nutrient being furnished by the lunch.

Both boys and girls in the 10 to 12 year age group met the requirements for riboflavin in the fall but the diets of the boys in the spring, although reduced, met 82% of the National Research Council allowance and the girls only 60%. The school lunch in the spring furnished more than 1/2 of the requirement for riboflavin.

The diets of the boys in the older group met or exceeded the recommended allowance of 2.1 milligrams of riboflavin. As in the case of iron, the girls within this same age range were the lowest of the entire group with the lunch at school providing 1/2 to 3/4 of the daily riboflavin requirements.

Niacin

Sixty-two percent of the National Research Council allowance of niacin was met by the diets of the 7 - 9 year old girls in the fall of the year with the school lunch furnishing 29% of this amount. There was marked improvement in the spring diets of the younger girls which met 90% of the National Research Council allowance, the noon meal furnishing more than 1/2 of the niacin in the girl's diets.

Approximately 3/4 of the National Research Council allowance for niacin was met by both the boys and girls in

the 10 - 12 year old group in the fall season, nearly 1/2 of this amount was furnished by the school lunch. The boys' spring diet showed an improvement but the girls' diet remained about the same with the school supplying 3/4 of the niacin for the 10 - 12 year old girls.

The adolescent boys exceeded the National Research Council allowance for niacin in both the fall and spring study. Having adequate diets in protein, it would be assumed that the 13 to 15 year old boys would have an adequate amount of niacin. The adolescent girls' diet was low in niacin and remained unchanged for both fall and spring study. The school lunch contributed more than 1/2 of the niacin in the girls' diet. The mean percent for both seasons for the 13 - 15 year old girls was 62% which was lower than that of the 7 - 9 year old subjects studied.

Vitamin C

Fifty percent of the National Research Council allowance was consumed in the diets of the 7 - 9 year old girls in the fall of the year with the school lunch furnishing 22% of this amount, which was low. There was improvement in vitamin C intake in the spring both in the meals furnished at home and in the noon meal at school. The diet furnished 71% of the recommended amount with the lunch at school furnishing 34%.

The 10 - 12 year old girls met only 39% of the National

Research Council allowance for vitamin C of which 24% was furnished by the school in the study made in the fall of the year. Improvement was shown in the diets of the girls in the spring but this was due to the marked improvement in vitamin C of the noon meals. The diets of the boys in the same age group was similar to that of the girls. The boys had a mean for fall and spring of 47% and the girls of 49% of the National Research Council allowance for vitamin C with the school meal contributing about one-half.

The teen-age girls met 29% of the National Research Council allowance of vitamin C in the fall and 52% in the spring. The lunch at school contributed 19% of the amount in the fall and the improvement in vitamin C intake in the spring is attributed to the increase of vitamin C in the noon meal and not in the home diet.

Boys in the 13 - 15 year old group met 48% of the National Research Council allowance with approximately one-half of the vitamin C being supplied by the free lunch. There was marked improvement in the home diets of the adolescent boys in the spring, which met the recommended allowance of 90 milligrams of vitamin C for this age.

Chart 1

School Lunch and Total Daily Nutrient Intakes Consumed by 7 - 9
Year Old Subjects Compared with Recommended Daily Dietary
Allowances of the National Research Council.

From Chart 1, in which the school lunch and the total daily diet is compared with the Recommended Daily Allowances for subjects from 7 - 9 years of age, it can be seen that:

1. The school lunch provided 50% of the Caloric intake and 50% of four nutrients, protein, iron, vitamin A and niacin of the subjects in the 7 - 9 year old age group.
2. The school lunch furnished from 49% to 43% of the total daily intake of: riboflavin (49%), ascorbic acid (47%), Calcium (45%), and thiamine (43%).
3. No child in this group met or exceeded the amount recommended for this age group.
4. The children of the 7 - 9 year old group were lowest in Calories, Vitamin A and Ascorbic Acid.

CHART I

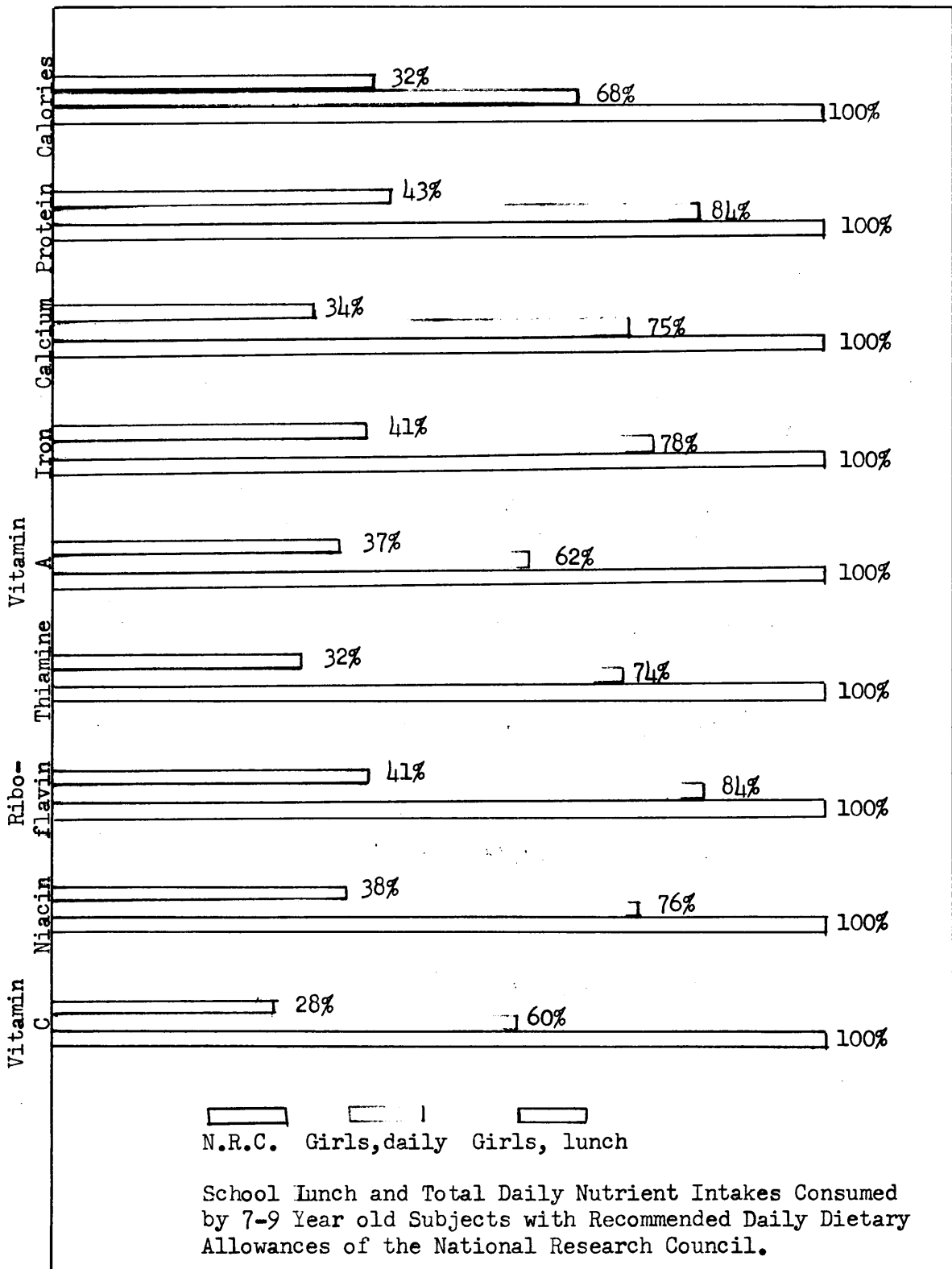


Chart 2

School Lunch and Total Daily Nutrient Intake Consumed by 10 - 12 Year Old Subjects Compared With Recommended Daily Dietary Allowances of the National Research Council.

Chart 2, which graphs the percentage of nutrients consumed daily and at the school lunch with the Recommended Daily Allowances for girls and boys from 10 - 12 years old, discloses that:

1. The 10 - 12 year old girls were noticeably low in calories, vitamin A and ascorbic acid.
2. The school lunch furnished 50% to 62% of calories, protein, vitamin A, niacin and ascorbic acid of the nutrients consumed daily by the girls in this age group.
3. Neither girls or boys met or exceeded the nutrients recommended by the National Research Council for 10 - 12 year old children.
4. The boys in this age bracket exceeded the girls to a small extent in total nutrients consumed daily.

CHART II

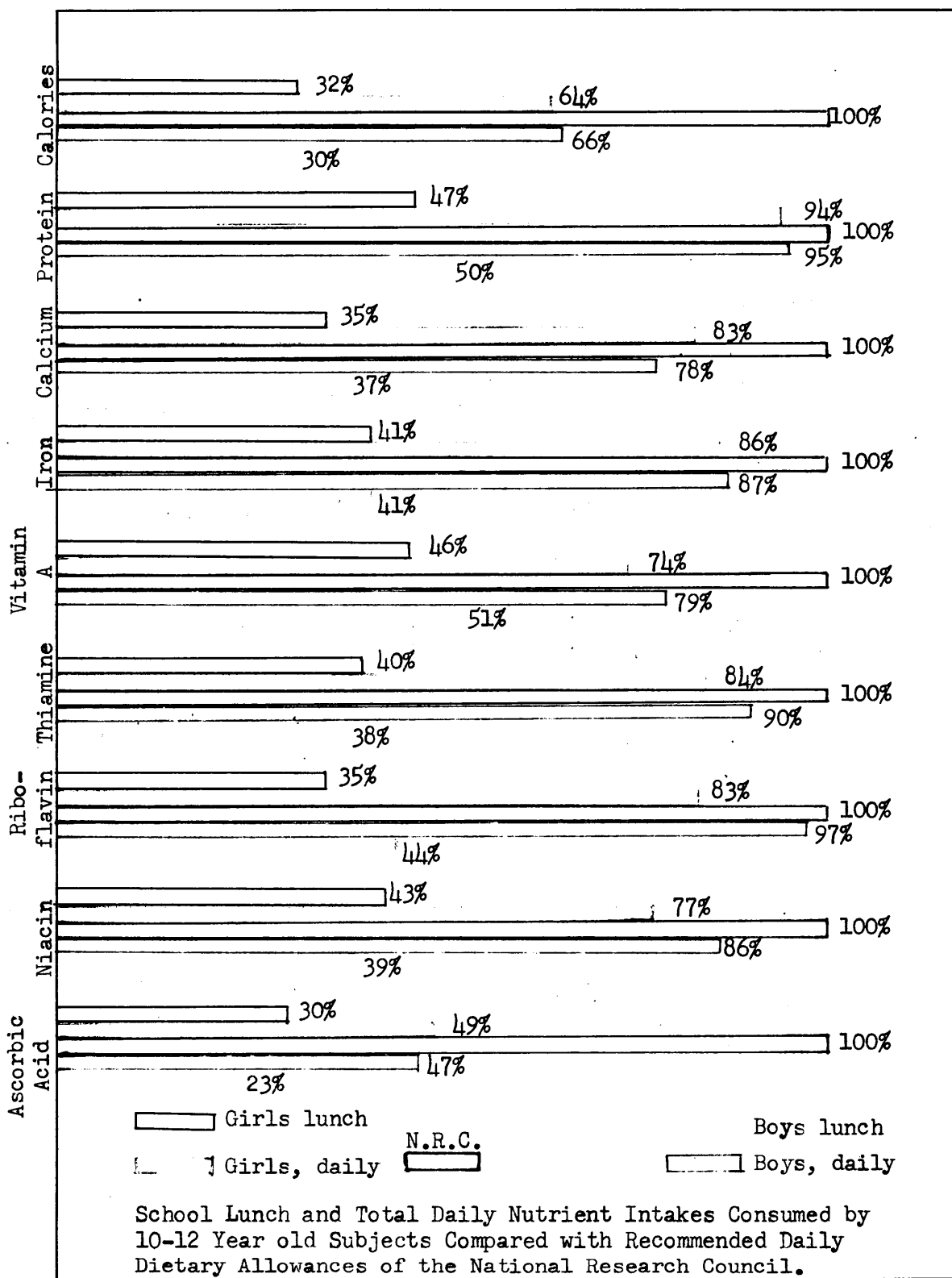


Chart 3

School Lunch and Total Daily Nutrient Intake Consumed by 13 - 15 Year Old Subjects Compared With Recommended Daily Dietary Allowances of the National Research Council.

Chart 3, on which the school lunch and total daily nutrients consumed by 13 - 15 year old subjects as compared with Recommended Daily Allowances are graphed by sex, divulges that:

1. For the girls in this group, the school lunch furnished more than one-half of the total amount consumed of five nutrients, namely, calcium, vitamin A, thiamine, riboflavin, niacin, and ascorbic acid.
2. The 13 - 15 year old girls diets are comparatively equivalent to that of the 7 - 9 year old girls.
3. No girl in this group met or exceeded the recommendations of the National Research Council for 13 - 15 year old subjects.
4. The boys in this age group met at least 75% of the requirements as recommended by the National Research Council and exceeded the amount in five nutrients: protein, calcium, vitamin A, riboflavin and niacin.
5. The school lunch furnished from 24% - 59% of the total nutrients consumed by the 13 - 15 year old subjects.

CHART III

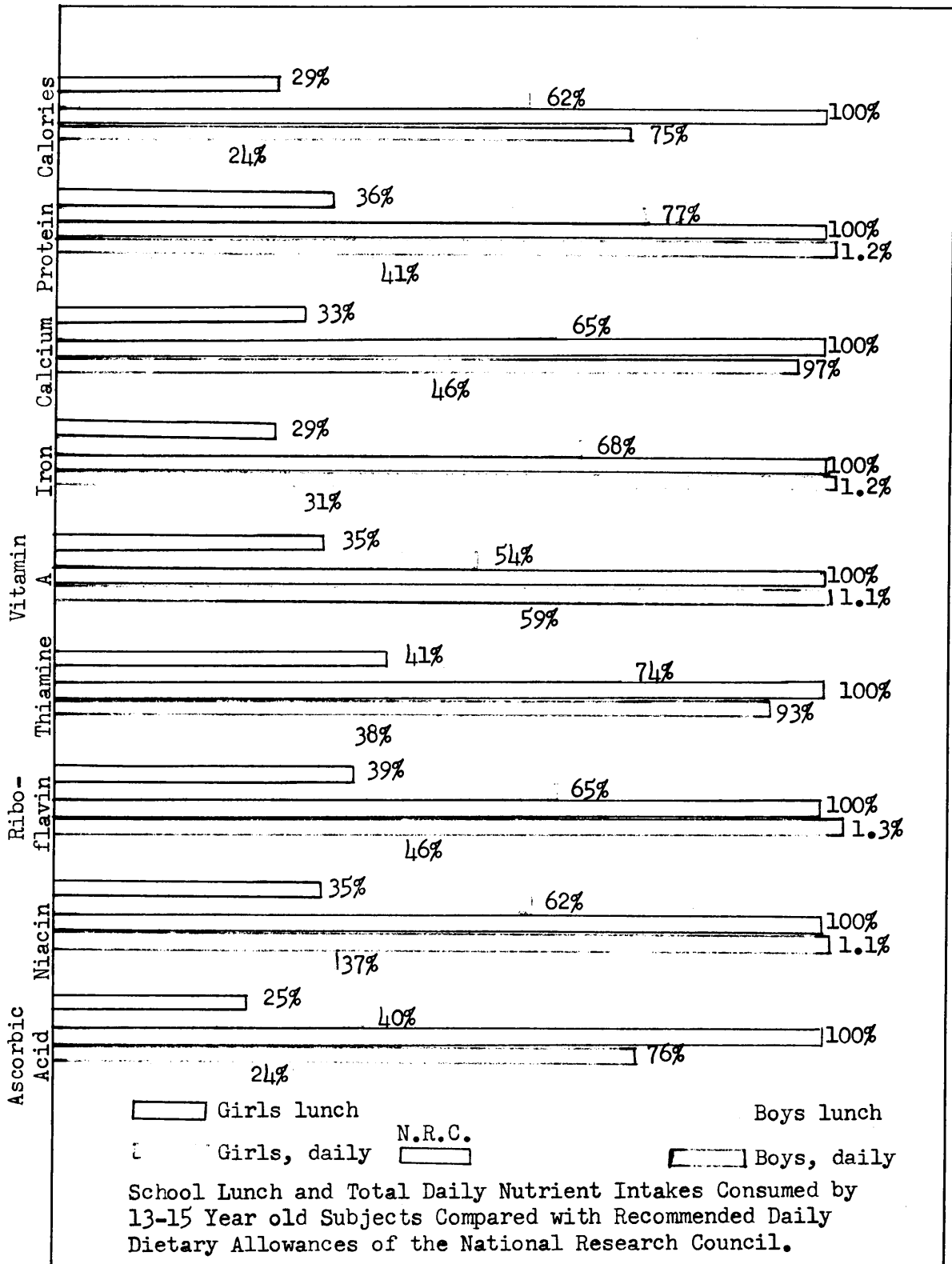


Table II

Relationship of Social Adjustment of 32 Subjects to Nutritive Intake of Diet.

The subjects studied were divided into four groups:

- (1) Average: Those subjects meeting at least 75% of the National Research Council allowance for all the nutrients studied. (Protein, iron, calcium, vitamin A, riboflavin, niacin, ascorbic acid and calories.)
- (2) Poor: Those subjects meeting 75% of the National Research Council allowance in at least eight nutrients.
- (3) Very poor: Those subjects meeting less than 75% of the National Research Council allowance in more than four nutrients.
- (4) Extremely poor: Those subjects meeting less than 75% of the National Research Council allowance in more than seven nutrients.

Each child was rated as poor, average or superior by school personnel as to his social adjustment. The chi square values for goodness of fit determined from the statistical analysis of the thirty-two subjects is given in Table II and shows that there is no evidence of any relationship between the nutritive intake of the diets of the children studied

TABLE II

Relationship of Social Adjustment of 32
Subjects to Nutritive Intake of Diet

Classification of Diets	Social Adjustment Grouped from Superior Adjusted to Poorly Adjusted			
	Superior	Average	Poor	Total
Extremely Poor	0	2	4	6
Very Poor	1	8	7	16
Poor	1	7	2	10
Average	0	0	0	0
Total	2	17	13	32

$$\chi^2 = 4.5375$$

$$P. > .30$$

and their social adjustments. Studies have been made in Connecticut (8) that found twice as high a percentage of socially maladjusted children in the poor diet group as in the better diet group.

Table III

Relationship of Growth of 32 Subjects as Measured by the
Wetzel Grid to Nutritive Intake.

The observer wanted to study the relation of caloric and nutrient intakes to growth as measured by the Wetzel-grid (37). Wetzel plots height-weight data and groups results of these data into the following categories: A_2 , A_3 , A_4 , which represents children of heavy, stocky build; A_1 , M_1 , B_1 , the middle channels, represents children of more nearly average build; B_2 , B_3 , B_4 represents the channel of thinner, lighter children.

"The major purpose of the grid panel is to recognize those children who move out of their appropriate channels. Constancy in one channel is presumed to indicate that body build is the predominant factor whereas change of channel is strongly indicative that an unfavorable nutritional or health factor is responsible (36)." Dr. Wetzel believes that any child whose growth plot falls in B_2 channel and below should have his environment observed and needs clinical and laboratory examinations.

Table III shows the relationship of caloric and nutrient intake to the growth patterns as measured by the Wetzel-grid for the 32 subjects observed. When the data presented on Table III was analyzed statistically for goodness of fit, the chi square values determined from them showed a

TABLE III

Relationship of Height-Weight Data of 32 Subjects
to Nutritive Intake to Growth as Measured by
the Use of the Wetzel-grid.

Classification of Diets	Clinical Ratings From Obese to Poor in Terms of Body Build								Total
	A ₄	A ₃ & A ₂	A ₁	M	B ₁	B ₂	B ₃ & B ₄	B ₄	
Extremely Poor	0	1		2			4	2	9
Very Poor	1	0		5			6	1	13
Poor	0	3		5			1	1	10
Average	0	0		0			0	0	0
Total	1	4		12			11	4	32

$$\chi^2 = 12.5590$$

$$P \approx .05$$

statistically significant relationship at the five percent level between nutrient intake and growth patterns. Those children with diets deficient in the most nutrients were growing at the slowest rate. One half of the children studied were in the B_2 , B_3 , B_4 growth channels. Only one child studied was rated as stocky and four were grouped as borderline nutrition cases as classified by the Wetzel-grid.

Tables IV and V

Relationship of Academic Achievement of 32 Subjects to
Nutritive Intake of Diet.

The observer thought there might be some relationship between the diets of the girls and boys participating in the study and of the academic achievement of the 32 subjects.

Evaluating a child's progress in relation to his potentialities in Fairfax County schools is accomplished by a five-letter grading system. If a child is making excellent or above average progress, it is denoted by the letter E; if he is making satisfactory progress, it is signified by the letter G; if average progress is being made, the letter M is used; if little progress has been made by the child, a grade of L is used; if the progress has been unsatisfactory, it is signified by a U.

In Tables IV and V the grades were arranged from unsatisfactory to excellent progress in subject matter. The percentage of nutrient intake was assembled from the lowest dietary intake to the most satisfactory. Table IV shows the relationship of the first semester of academic achievement to nutritive intake of diet for the fall season of the year. Table V is the relationship of academic achievement for the second semester.

If this is an adequate test of academic achievement of the children observed, then the results shown in Tables IV and V show that there was no relationship of grade averages and nutrient intake.

TABLE IV

Relationship of First Semester of Academic Achievement of
32 Subjects to Nutritive Intake of Diet During the Fall
Season of the Year.

Classification of Diets	Academic Achievement Grouped From Unsatisfactory to Excellent Progress					Total
	U	L	M	G	E	
Extremely Poor	3	4	6	0	0	13
Very Poor	2	3	1	1	1	8
Poor	1	5	4	0	0	10
Average	0	0	1	0	0	1
Total	6	12	12	1	1	32

$$\chi^2 = 5.9959$$

$$P = .90$$

TABLE V

Relationship of Second Semester of Academic Achievement of 32 Subjects to Nutritive Intake of Diet During the Spring Season of the Year.

Classification of Diets	Academic Achievement Grouped From					Total
	Unsatisfactory	U	L	M	G	Excellent Progress
Extremely Poor	3	2	0	1	0	6
Very Poor	1	8	4	2	0	15
Poor	0	6	5	0	0	11
Average	0	0	0	0	0	0
Total	4	16	9	3	0	32

$$\chi^2 = 5.8854$$

$$P = .50$$

Table VI

Relationship of Dental Caries of 32 Subjects to Nutritive Intake of Diet.

Table VI deals with the number of dental caries of 32 subjects in relation to the dietary intake. Before the study was begun, each child was examined by the dentist from the Fairfax County Health Department. The results were compiled into five groups ranging from the greatest number of caries to the least, as follows:

Group 1 - children with 24 or more caries.

Group 2 - children with 24 to 20 caries.

Group 3 - children with 19 to 15 caries.

Group 4 - children with 14 to 10 caries.

Group 5 - children with 9 or less caries.

The relation of incidence of dental caries to nutrient intake was highly significant at the 1% level.

Sherman has stated that there are at least five factors that contribute to good teeth and gums: calcium, phosphorus, and vitamins A, C, and D (45).

A study conducted in Montgomery County, Virginia, of the nutritional status of pre-adolescent boys and girls of both the white and negro race revealed that over 50% of the children of each race had carious teeth, 49% of the white and 12% of the negro children had filled teeth (44).

TABLE VI

Incidence of Dental Caries of 32 Subjects in
Relation to the Nutrient Intake.

Classification of Diets	Number of Dental Caries Grouped From the Greatest Number to the Least,					Total
	24 or above	24-20	19-15	14-10	9 or less	
Extremely Poor	1	0	0	3	3	7
Very Poor	2	5	2	3	3	15
Poor	1	0	2	3	4	10
Average	0	0	0	0	0	0
Total	4	5	4	9	10	32

$$\chi^2 = 19.9929$$

$$P \approx .01$$

Chapter V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this investigation was to study the diets of children receiving free lunches in three rural schools of Fairfax County, Virginia, in order to determine the adequacy of the school lunch program to these children. Factors included in this study were: (1) the adequacy of the home diet consumed, (2) the adequacy of the school lunch in relation to the home diet, (3) the relationship of the diets of free lunch children in regard to school attendance, academic achievement, social adjustment, physical factors such as weight, growth and dental caries, (4) and to adjudge the necessity of supplementing the school lunch to meet the needs of the individual school.

This study was limited to thirty-two white elementary students receiving free lunches in three rural schools. The children ranged in age from seven to fourteen.

The investigator visited the homes of the children participating in the study and instructed the mothers in methods of measuring and recording the food. During the study, the observer visited the school daily to assist pupils in recording food eaten at school and to collect data from the preceding day.

The study was conducted for fourteen consecutive days during November - December of 1956 and for seven days in April - May of 1957.

From these data collected, the following can be concluded:

- (1) The home diets were inadequate providing from 25 - 43% of the Recommended Daily Allowances for 7 - 9 year old children; 19 - 48% of the Recommended Daily Allowances for girls 10 - 12 years; 24 - 53% of the Recommended Daily Allowances for boys 10 - 12 years; 15 - 41% of the Recommended Daily Allowances for girls 13 - 15 years; 51 - 89% of the Recommended Daily Allowances for boys 13 - 15 years.
- (2) The food consumption of all the girls studied was less adequate than that of the boys, the poorest fed group being that of the teen-age girls.
- (3) The home diets furnishing the greatest variety of food was that of the 13 - 15 year old boys.
- (4) The school lunch furnished a greater variety of foods than was furnished at home.
- (5) The subjects studied were scored by school personnel as to social adjustment. When the relationship of social adjustment to nutritive intake was determined by chi square values, there was no evidence that diet had any interdependence on social adjustments of children observed.
- (6) The academic progress of the subjects was analyzed for the first and second semester of school. There

was no evidence of correlation between nutritive intakes and academic achievement of the children participating in this survey.

- (7) The number of dental caries of the 32 subjects was calculated in relationship to nutritive intake and it was found that a high degree of correlation existed between the diets of children and between instances of dental caries.
- (8) The relationship of nutrient intake to the growth patterns of the 32 subjects was measured by the Wetzel-grid, and the chi-square value determined. There was a statistical relationship at the five percent level between nutrient intakes and growth patterns, showing that subjects with poorest diets were growing at the slowest rate.
- (9) After calculating, studying, and comparing the results of diets and the school lunches with the Recommended Daily Allowances of the National Research Council, the school lunch program needs to supplement the home diets of free lunch children by increasing the use of the following nutrients: Calories, vitamin A, calcium, and ascorbic acid.

Recommendations

1. School lunch employees need more instruction and assistance in planning, preparing and serving foods to meet the Recommended Daily Allowance of growing girls and boys.
2. There is need of more detailed study of absenteeism among free lunch children--the causes, the nature and duration in relationship to nutritive intake.
3. Further study needs to be made on eating habits of free lunch children.
4. There is need for nutrition education for parents that have limited formal education.
5. The failure to find a larger percentage of significant results is probably due to the smallness of the number studied, therefore, it is suggested that there is need to repeat such a study on a larger scale.
6. It is desirable to have a physician's examination of each child participating in the study to determine if pathological conditions are associated with low nutritive intakes.
7. Since none of the children from 7 - 13 years of age had diets that met the standards of the National Research Council, greater emphasis on nutrition education should be included in the primary and elementary curricula.

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APPENDIX

PERSONNEL DATA OF THIRTY-TWO SUBJECTS IN THREE

Subjects by Age Groups 10-12 yrs.	Sex-Age	Occupation of		Employment of Mother		Education of		Academic Achievement Semesters 1st - 2nd	
		Mother	Father	Part X	Full X	Mother	Father	1st	2nd
1. Billy M.	M 11	Home- maker	Odd Jobs	0	0	Can Write	None	L	L
2. Robert S.	M 12	"	"	0	0	5	5	L	L
3. Walter S.	M 12	"	"	0	0	5	5	L	U
4. Robert D.	M 12	"	Carpenter	0	0	4	5	L	L
5. Charles K.	M 12	"	Day Laborer	0	0	3	3	M	M
6. Wilbur S.	M 11	"	"	0	0	None	None	M	M
7. Billy W.	M 12	"	Mechanic	0	0	"	"	U	L
8. Earl C.	M 12	"	Deceased	0	0	8	8	L	L
9. David W.	M 12	"	Laborer	0	0	8	7	L	M
10. Glen C.	M 11	"	Deceased	0	0	8	8	L	L
11. Teddy K.	M 10	"	Truck Driver	0	0	3	3	L	U

13-15 yrs.

12. Eugene M.	M 13	"	Welfare	0	0	7	4	M	M
13. Charles M.	M 14	"	"	0	0	3	1	L	L
14. Kelly M.	M 13	"	Mining	0	0	8	10	L	M

7-9 yrs.

1. Linda A.	F 9	"	Laborer	0	0	5	3	U	U
2. Mary L.	F 8	"	Carpenter	0	0	None	None	M	M
3. Carol T.	F 8	"	"	0	0	2	6	L	L
4. Carolyn W.	F 9	"	Part Time Mechanic	0	0	None	None	M	M
5. Judy L.	F 9	"	Truck Driver	0	0	"	"	L	L
6. Iris P.	F 9	"	Junk Dealer	0	0	8	8	L	M

10-12 yrs.

7. Emma C.	F 12	"	Unemployed	0	0	7	6	L	L
8. Donna N.	F 10	"	Odd Jobs	0	0	8	7	L	L
9. Frances T.	F 11	"	Day Laborer	0	0	6	2	M	M
10. Judy W.	F 10	"	Laborer	0	0	3	3	M	M
11. Ruby W.	F 11	"	"	0	0	4	5	G	G
12. Maxine W.	F 10	"	"	0	0	8	4	M	M
13. Mildred W.	F 10	"	Carpenter	0	0	5	4	G	G

13-15 yrs.

14. Ethel W.	F 14	"	R.R. Signalman	0	0	5	4	M	M
15. Marie C.	F 14	"	Deceased	0	0	10	10	G	U
16. Lula T.	F 14	"	Saw Operator	0	0	2	6	L	L
17. Pauline D.	F 14	"	Laborer	0	0	5	4	U	U
18. Patricia B.	F 14	"	Painter	0	0	7	6	U	U

RURAL SCHOOLS OF FAIRFAX COUNTY, VIRGINIA

I.Q.	Social Adjustment			Days Absent		Number of Dental Carries
	Poor	Average	Superior	First Semester	Second Semester	
87	x			32	32	20
71		x		20	24	29
62	x			46	47	8
Not Gradeable	x			26	27	16
75		x		12	8	10
87		x		8	7	6
78	x			18	4	21
91	x			20	17	24
94		x		12	18	9
99	x			19	12	19
100		x		15	14	9

103			x	6	11	14
94		x		27	17	26
100		x		21	10	13

81	x			35	30	9
98		x		17	15	21
90		x		20	18	16
87		x		16	16	31
88	x			29	25	10
83		x		29	20	13

62	x			20	13	6
84	x			15	10	11
108	x			6	4	10
87		x		10	8	31
111		x		13	10	15
98		x		3	1	9
Not Gradeable		x		10	9	5

100			x	11	5	6
102	x			18	26	6
78	x			24	22	10
99		x		40	38	12
72		x		8	6	7

INDIVIDUAL PERSONNEL RECORD
OF CHILDREN PARTICIPATING IN STUDY FROM _____ SCHOOL

NAME OF PUPIL: _____

SEX: _____ AGE: _____ GRADE: _____

NAME OF PARENTS OR GUARDIAN: _____

ADDRESS OF PARENTS OR GUARDIAN: _____

DISTANCE FROM SCHOOL: _____

OCCUPATION OF PARENT OR GUARDIAN: _____

MOTHER EMPLOYED OUTSIDE OF HOME: (Part Time) (Full Time)

MOTHER'S OCCUPATION: _____

EDUCATION OF PARENTS: (Check appropriate column)

EDUCATION OF FATHER: _____ Elem. _____ High School
_____ College

EDUCATION OF MOTHER: _____ Elem. _____ High School
_____ College

NUMBER OF DAYS ABSENT DURING 1956-57 SCHOOL TERM:

FIRST SEMESTER _____

SECOND SEMESTER _____

TOTAL _____

ACADEMIC ACHIEVEMENT: _____

(a) Grade Average ... First Semester _____

Second Semester _____

(b) I. Q. _____

Name of Test _____

NUMBER OF DENTAL CARIES _____

SOCIAL ADJUSTMENTS

CHARACTERISTICS	Poor	Average	Superior
<u>Classroom:</u>			
1. Attention--good attention span			
2. Cooperation--works well with classmates			
3. Alertness--quick to grasp ideas			
4. Interest--interest and enthusiasm for school activities			
5. Effort--tries consistently			
6. Discussion--participates readily			
<u>Relationship with others:</u>			
7. Schoolmates--well liked by fellow students			
8. Adult school personnel--friendly			
9. At play--plays well with others			
<u>Emotional:</u>			
10. Temper--self control			
11. Jealousy--no evidence			
12. Disposition--happy			
13. Depression--cheerful			
14. Emotional control--seldom upset			
<u>Personal:</u>			
15. Appearance--attractive			
16. Courtesy--considerate			
17. Day dreams--no evidence			
18. Social confidence--makes friends and keeps them			
19. Self-confident--self-reliant			

INDIVIDUAL DAILY RECORD OF FOOD EATEN

NAME OF PUPIL: _____ DATE: _____ DAY OF WEEK: _____

SCHOOL _____

MEAL	FOOD EATEN	AMOUNT OF FOOD EATEN	COMMENTS (Frozen, Canned or Fresh)
Breakfast			
Food eaten between breakfast and the noon meal.			
Noon Meal			
Food eaten between noon meal and supper.			
Supper			
Food eaten between supper and bed time.			

INDIVIDUAL DIETARY CALCULATION

FOR TWO-WEEK PERIOD

NAME OF PUPIL: _____

DATE _____

Month - Day - Year

SCHOOL: _____

AGE: _____

GRADE: _____

Food	Measure	Calories	Protein	Calcium	Iron	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic Acid

SUMMARY OF INDIVIDUAL TOTAL DIETARY CALCULATIONS FOR CHILDREN
(TWO WEEKS)
IN THE THREE RURAL SCHOOLS FOR (WEEKENDS) PERIOD
(THREE WEEKS)

[illegible]

TOTAL DIETARY CALCULATIONS FOR CHILDREN
IN THREE RURAL SCHOOLS FOR WEEKEND FOOD CONSUMPTION

[illegible]

CALCULATED MEAN DAILY CALORIC INTAKE OF GIRLS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
7-9	F	Fall	1	12854	918	596	322
			2	14300	1021	503	518
			3	21079	1506	520	986
			4	19202	1372	731	641
			5	14425	1016	428	588
			6	19289	1377	737	640
7-9	F	Spring	1	8266	1181	522	659
			2	9159	1308	544	764
			3	10423	1489	723	766
			4	12434	1776	1171	605
			5	10247	1464	690	774
			6	12797	1828	961	867
10-12	F	Fall	7	27221	1944	1041	903
			8	19436	1388	607	781
			9	17033	1217	601	616
			10	17120	1222	643	579
			11	22702	1622	763	859
			12	20539	1467	851	616
			13	15855	1061	540	621
10-12	F	Spring	7	12331	1761	917	844
			8	12081	1725	940	781
			9	9067	1295	679	616
			10	8495	1213	634	579
			11	11082	1583	724	859
			12	12260	1751	919	832
			13	10731	1533	647	886
13-15	F	Fall	14	24884	1777	965	812
			15	20315	1451	660	791
			16	20346	1453	383	1070
			17	18464	1319	667	652
			18	17980	1284	599	685
13-15	F	Spring	14	10211	1459	860	599
			15	9740	1391	640	751
			16	11583	1655	412	1243
			17	13029	1861	805	1056
			18	12434	1468	1171	835

CALCULATED MEAN DAILY PROTEIN INTAKE OF GIRLS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
7-9	F	Fall	1	516	37	24	13
			2	504	36	24	12
			3	879	63	40	23
			4	486	35	12	23
			5	544	39	15	24
			6	722	52	26	26
7-9	F	Spring	1	332	47	15	32
			2	404	58	19	39
			3	479	68	40	28
			4	372	53	25	28
			5	400	57	21	36
			6	449	64	36	28
10-12	F	Fall	7	1221	87	54	33
			8	1122	80	40	40
			9	789	56	30	26
			10	727	52	25	27
			11	941	67	35	32
			12	971	69	43	26
			13	545	39	17	22
10-12	F	Spring	7	490	70	40	30
			8	531	76	43	33
			9	335	48	18	30
			10	481	69	40	29
			11	356	51	21	30
			12	537	77	19	58
			13	415	59	27	32
13-15	F	Fall	14	940	67	23	44
			15	741	53	23	30
			16	619	44	24	20
			17	1020	73	42	31
			18	792	56	25	31
13-15	F	Spring	14	522	74	36	38
			15	359	51	38	13
			16	422	60	21	39
			17	504	72	45	27
			18	488	69	55	14

CALCULATED MEAN DAILY CALCIUM INTAKE OF GIRLS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
7-9	F	Fall	1	7	.50	.32	.18
			2	6	.43	.30	.13
			3	11	.78	.38	.40
			4	11	.78	.36	.42
			5	9	.64	.17	.47
			6	9	.64	.24	.40
7-9	F	Spring	1	4	.57	.37	.20
			2	5	.71	.35	.36
			3	6	.86	.68	.20
			4	4	.57	.17	.40
			5	10	1.42	1.00	.42
			6	8	1.14	.64	.50
10-12	F	Fall	7	12	.86	.36	.50
			8	7	.50	.14	.36
			9	14	1.00	.63	.37
			10	10	.71	.28	.43
			11	13	.93	.53	.40
			12	24	1.71	1.31	.40
			13	13	.93	.69	.24
10-12	F	Spring	7	7	1.00	.60	.40
			8	5	.71	.31	.40
			9	6	.86	.42	.44
			10	5	.71	.29	.42
			11	11	1.57	1.07	.50
			12	10	1.43	.93	.50
			13	7	1.00	.50	.50
13-15	F	Fall	14	8	.57	.09	.48
			15	17	1.21	.68	.53
			16	11	.78	.57	.21
			17	11	.78	.37	.41
			18	9	.60	.27	.37
13-15	F	Spring	14	7	1.00	.58	.42
			15	3	.43	.07	.36
			16	5	.71	.15	.56
			17	7	1.00	.52	.48
			18	6	.86	.40	.46

CALCULATED MEAN DAILY IRON INTAKE OF GIRLS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
7-9	F	Fall	1	59	4.21	2.51	1.70
			2	106	7.57	2.77	4.80
			3	153	10.92	8.32	2.60
			4	126	9.00	5.60	3.40
			5	122	8.71	1.11	7.60
			6	107	7.64	3.84	3.80
7-9	F	Spring	1	38	5.43	1.63	3.80
			2	48	6.86	2.06	4.80
			3	63	9.00	5.72	3.28
			4	54	7.71	4.91	2.80
			5	48	6.86	2.66	4.20
			6	73	10.43	6.23	4.20
10-12	F	Fall	7	218	15.57	9.67	5.90
			8	112	8.00	3.60	4.40
			9	178	12.71	8.41	4.30
			10	150	10.71	4.40	6.31
			11	135	9.64	5.54	4.60
			12	228	16.28	11.98	4.30
			13	93	6.64	1.84	4.80
10-12	F	Spring	7	69	9.86	6.06	3.80
			8	73	10.43	6.43	4.00
			9	40	5.71	2.45	3.26
			10	43	6.14	2.74	3.40
			11	56	8.00	3.80	4.20
			12	97	13.86	2.06	11.80
			13	76	10.86	6.26	4.60
13-15	F	Fall	14	164	11.71	4.91	6.80
			15	236	16.86	12.06	4.80
			16	77	5.50	3.20	2.30
			17	134	9.57	5.27	4.30
			18	114	8.14	3.34	4.80
13-15	F	Spring	14	62	8.86	4.06	4.80
			15	57	8.14	4.74	3.40
			16	68	9.71	4.25	5.46
			17	78	11.14	7.14	4.00
			18	66	9.43	5.83	3.60

CALCULATED MEAN DAILY VITAMIN A INTAKE OF GIRLS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
7-9	F	Fall	1	23682	1692	803	889
			2	53468	3819	2199	1620
			3	38550	2753	1853	900
			4	18386	1313	320	993
			5	26718	1908	23	1885
			6	20666	1476	108	1368
7-9	F	Spring	1	13612	1945	1395	550
			2	17653	2522	600	1922
			3	20064	2866	945	1921
			4	16723	1194	236	958
			5	18209	1301	363	938
			6	21977	3140	1333	1807
10-12	F	Fall	7	98660	7047	1441	5606
			8	25292	1807	1072	735
			9	42300	3021	118	2903
			10	34446	2460	555	1905
			11	26438	1888	499	1389
			12	47301	3379	476	2903
			13	33699	2407	1147	1260
10-12	F	Spring	7	30455	4351	2330	2021
			8	15508	2215	856	1359
			9	15423	2203	497	1706
			10	21350	3050	1303	1747
			11	16734	2391	444	1947
			12	19321	2760	1179	1581
			13	53056	7579	5762	1817
13-15	F	Fall	14	54645	3903	110	3793
			15	26608	1901	686	1215
			16	26508	1893	931	962
			17	30614	2187	429	1758
			18	43983	3141	1258	1883
13-15	F	Spring	14	18895	2699	573	2126
			15	18031	2576	798	1778
			16	18423	2632	1771	861
			17	21608	3087	1809	1278
			18	21429	3061	1008	2053

CALCULATED MEAN DAILY RIBOFLAVIN INTAKE OF GIRLS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
7-9	F	Fall	1	8	.57	.25	.32
			2	18	1.29	1.02	.27
			3	27	1.93	1.23	.70
			4	21	1.50	.88	.62
			5	28	2.00	.47	1.53
			6	17	1.21	.41	.80
7-9	F	Spring	1	6	.86	.46	.40
			2	6	.86	.50	.36
			3	11	1.57	.89	.68
			4	7	1.00	.40	.60
			5	7	1.00	.52	.48
			6	9	1.29	.69	.60
10-12	F	Fall	7	61	4.36	3.52	.84
			8	21	1.50	.80	.70
			9	20	1.43	.63	.80
			10	20	1.43	.77	.66
			11	31	2.21	1.71	.50
			12	23	1.64	.84	.80
			13	12	.86	.46	.40
10-12	F	Spring	7	10	1.43	.89	.54
			8	5	.71	.41	.30
			9	7	1.00	.36	.64
			10	8	1.14	.54	.60
			11	8	1.14	.38	.76
			12	8	1.14	.42	.72
			13	7	1.00	.42	.58
13-15	F	Fall	14	33	2.36	1.13	1.23
			15	19	1.36	.58	.78
			16	8	.57	.38	.19
			17	20	1.43	.63	.80
			18	19	1.36	.52	.84
13-15	F	Spring	14	8	1.14	.22	.92
			15	7	1.00	.36	.64
			16	8	1.14	.50	.64
			17	11	1.57	.37	1.20
			18	7	1.00	.40	.60

CALCULATED MEAN DAILY THIAMINE INTAKE OF GIRLS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
7-9	F	Fall	1	7	.50	.39	.11
			2	13	.93	.63	.30
			3	16	1.14	.84	.30
			4	14	1.00	.69	.31
			5	9	.64	.34	.30
			6	12	.86	.46	.40
7-9	F	Spring	1	4	.57	.17	.40
			2	4	.57	.19	.38
			3	5	.71	.31	.40
			4	4	.57	.27	.40
			5	4	.57	.21	.36
			6	6	.86	.65	.21
10-12	F	Fall	7	23	1.64	.89	.75
			8	16	1.14	.41	.73
			9	18	1.29	.86	.43
			10	11	.79	.48	.31
			11	15	1.07	.72	.35
			12	23	1.64	1.24	.40
			13	11	.79	.17	.62
10-12	F	Spring	7	6	.86	.36	.50
			8	6	.86	.50	.36
			9	3	.43	.15	.28
			10	4	.57	.31	.26
			11	7	1.00	.50	.50
			12	8	1.14	.34	.80
			13	6	.86	.36	.50
13-15	F	Fall	14	23	1.64	.64	1.00
			15	14	1.00	.49	.51
			16	8	.57	.37	.20
			17	12	.86	.51	.35
			18	11	.79	.29	.50
13-15	F	Spring	14	7	1.00	.14	.86
			15	5	.71	.49	.22
			16	6	.86	.30	.56
			17	8	1.14	.54	.60
			18	7	1.00	.52	.48

CALCULATED MEAN DAILY NIACIN INTAKE OF GIRLS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
7-9	F	Fall	1	60	4.29	2.49	1.80
			2	85	6.07	2.94	3.13
			3	103	7.36	4.36	3.00
			4	94	6.71	4.21	2.50
			5	83	5.93	2.87	3.06
			6	95	6.79	2.99	3.80
7-9	F	Spring	1	52	7.43	3.63	3.80
			2	60	8.57	3.77	4.80
			3	95	13.57	7.57	6.00
			4	53	7.57	3.77	3.80
			5	66	9.42	3.62	5.80
			6	58	8.29	4.09	4.20
10-12	F	Fall	7	219	15.64	9.74	5.90
			8	137	9.79	3.89	5.90
			9	108	7.71	3.71	4.00
			10	114	8.14	4.54	3.60
			11	136	9.71	5.41	4.30
			12	130	9.28	5.28	4.00
			13	70	5.00	2.00	3.00
10-12	F	Spring	7	72	10.30	3.90	6.40
			8	109	15.57	5.37	10.20
			9	40	5.71	1.29	4.42
			10	59	8.43	4.83	3.60
			11	47	6.71	2.31	4.40
			12	71	10.14	2.54	7.60
			13	47	6.71	2.31	4.40
13-15	F	Fall	14	158	11.29	3.89	7.40
			15	105	7.50	2.50	5.00
			16	92	6.57	3.27	3.30
			17	129	9.21	5.31	3.90
			18	90	6.43	2.43	4.00
13-15	F	Spring	14	81	11.57	5.37	6.20
			15	51	7.29	3.69	3.60
			16	55	7.85	2.61	5.24
			17	49	7.00	3.20	3.80
			18	45	6.43	2.83	3.60

CALCULATED MEAN DAILY VITAMIN C INTAKE OF GIRLS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
7-9	F	Fall	1	388	27.7	15.3	12.4
			2	518	37.0	20.4	16.6
			3	414	29.57	15.37	14.20
			4	456	32.6	22.4	10.2
			5	406	29.0	14.4	14.6
			6	322	23.0	12.1	10.9
7-9	F	Spring	1	190	27.0	19.7	7.4
			2	264	37.7	13.9	23.8
			3	269	38.42	18.82	19.60
			4	174	24.85	7.65	17.20
			5	310	44.3	22.1	22.2
			6	590	84.3	50.1	34.2
10-12	F	Fall	7	609	43.5	19.6	23.9
			8	315	22.5	11.0	11.5
			9	299	21.3	9.0	12.3
			10	555	39.6	20.9	18.7
			11	460	32.8	13.5	19.3
			12	350	25.0	3.0	22.0
			13	303	21.6	4.8	16.8
10-12	F	Spring	7	206	29.4	9.4	20.0
			8	193	27.6	13.8	13.8
			9	145	20.7	5.1	15.6
			10	143	20.4	4.8	15.6
			11	437	62.4	27.8	34.6
			12	391	55.8	7.0	48.8
			13	664	94.8	60.2	34.6
13-15	F	Fall	14	488	34.8	8.2	26.6
			15	233	16.6	3.0	13.6
			16	236	16.8	7.0	9.8
			17	322	23.0	13.0	10.0
			18	319	22.8	5.5	17.3
13-15	F	Spring	14	315	45.0	26.6	18.4
			15	241	34.4	9.4	25.0
			16	228	32.6	23.2	9.4
			17	290	41.4	8.4	33.0
			18	374	53.4	14.6	38.8

CALCULATED MEAN DAILY CALORIC INTAKE OF BOYS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
10-12	M	Fall	19	21150	1510	604	906
			20	20789	1485	829	656
			21	20388	1456	532	924
			22	20034	1431	835	596
			23	27729	1980	1308	672
			24	26319	1880	1146	734
			25	19168	1369	851	518
			26	23001	1643	676	967
			27	20219	1444	772	672
			28	24659	1761	928	833
			29	29947	2139	1483	656
10-12	M	Spring	19	12501	1786	1003	783
			20	11140	1591	692	899
			21	10926	1561	683	878
			22	9018	1288	683	605
			23	16358	2337	1290	1047
			24	12006	1715	1018	697
			25	10023	1432	837	595
			26	9074	1296	691	605
			27	10524	1503	852	651
			28	14395	2056	1059	997
			29	13174	1882	970	912
13-15	M	Fall	30	30768	2198	1370	828
			31	32916	2351	1690	661
			32	33485	2392	1559	833
13-15	M	Spring	30	19761	2823	1975	848
			31	14828	2118	1327	791
			32	17397	2485	1782	703

CALCULATED MEAN DAILY PROTEIN INTAKE OF BOYS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
10-12	M	Fall	19	901	64	19	45
			20	1006	72	39	33
			21	782	56	20	36
			22	790	56	32	24
			23	1159	83	50	33
			24	1104	79	50	29
			25	1255	90	65	25
			26	916	65	29	36
			27	871	62	29	33
			28	1058	76	41	35
			29	1424	101	68	33
10-12	M	Spring	19	449	64	32	32
			20	511	73	18	55
			21	454	65	28	37
			22	425	61	31	30
			23	747	107	57	50
			24	463	66	33	33
			25	427	61	31	30
			26	446	64	36	28
			27	581	83	50	33
			28	596	85	41	44
			29	565	81	50	31
13-15	M	Fall	30	1330	95	56	39
			31	1642	117	96	21
			32	1445	103	68	35
13-15	M	Spring	30	744	106	70	36
			31	628	90	58	32
			32	691	99	71	28

CALCULATED MEAN DAILY CALCIUM INTAKE OF BOYS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
10-12	M	Fall	19	8	.57	.13	.44
			20	13	.93	.53	.40
			21	11.1	.79	.29	.50
			22	12	.86	.46	.40
			23	14	1.00	.53	.47
			24	17	1.21	.71	.50
			25	11	.78	.38	.40
			26	11	.78	.38	.40
			27	10	.71	.24	.47
			28	14	1.00	.30	.70
			29	19	1.36	.96	.40
10-12	M	Spring	19	11	1.57	1.17	.40
			20	5	.71	.29	.42
			21	5	.71	.31	.40
			22	6	.86	.46	.40
			23	9	1.28	.88	.40
			24	7	1.00	.58	.42
			25	6	.86	.46	.40
			26	4	.57	.17	.40
			27	6	.86	.44	.42
			28	9	1.3	.50	.80
			29	6	.86	.46	.40
13-15	M	Fall	30	19.10	1.36	.93	.43
			31	12.90	.92	.43	.49
			32	19	1.35	.65	.70
13-15	M	Spring	30	8	1.04	.66	.40
			31	10	1.40	.98	.42
			32	15	2.10	.70	1.40

CALCULATED MEAN DAILY IRON INTAKE OF BOYS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
10-12	M	Fall	19	146	10	4	6
			20	131	9	5	4
			21	144	10	4	6
			22	121	9	6	3
			23	157	11	6	5
			24	160	11	7	4
			25	191	14	4	10
			26	177	13	6	7
			27	120	8	3	5
			28	189	14	9	5
			29	181	13	9	4
10-12	M	Spring	19	63	9	5	4
			20	57	8	4	4
			21	61	4	2	2
			22	55	8	4	4
			23	143	20	8	12
			24	60	8	4	4
			25	57	8	5	3
			26	56	8	5	3
			27	63	9	5	4
			28	101	14	8	6
			29	88	12	8	4
13-15	M	Fall	30	238	17	11	6
			31	256	18	14	4
			32	240	17	12	5
13-15	M	Spring	30	103	15	11	4
			31	93	13	9	4
			32	134	19	14	5

CALCULATED MEAN DAILY VITAMIN A INTAKE OF BOYS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
10-12	M	Fall	19	40751	2911	154	2757
			20	28881	2063	258	1805
			21	77550	5539	1483	4056
			22	47890	3421	2230	1191
			23	29121	2080	634	1446
			24	53189	3799	1352	2447
			25	37869	2705	1068	1637
			26	34371	2455	2066	389
			27	24159	1726	280	1446
			28	92141	6582	2678	3904
			29	38388	2742	937	1805
10-12	M	Spring	19	34758	4965	451	4514
			20	20423	2918	544	2374
			21	21003	3000	558	2442
			22	18961	2709	925	1784
			23	42735	6105	2212	3893
			24	21020	3003	1150	1853
			25	17564	2522	876	1646
			26	15768	2252	594	1658
			27	18856	2694	982	1712
			28	56580	8083	4221	3862
			29	27389	3913	1756	2157
13-15	M	Fall	30	102244	7303	3275	4028
			31	85083	6077	2173	3904
			32	78529	5609	1759	3850
13-15	M	Spring	30	39916	5702	3788	1914
			31	24901	3557	1015	2542
			32	37644	5378	3877	1501

CALCULATED MEAN DAILY RIBOFLAVIN INTAKE OF BOYS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
10-12	M	Fall	19	22	1.57	.57	1.00
			20	32	2.29	1.49	.80
			21	19	1.36	.46	.90
			22	32	2.29	1.49	.80
			23	31	2.21	1.41	.80
			24	34	2.43	1.63	.80
			25	22	1.57	.57	1.00
			26	38	2.71	.51	2.2
			27	22	1.57	.77	.80
			28	24	1.71	1.01	.70
			29	34	2.43	1.53	.90
10-12	M	Spring	19	9	1.29	.89	.40
			20	5	.71	.31	.40
			21	8	1.14	.54	.60
			22	9	1.29	1.09	.20
			23	24	3.43	2.03	1.4
			24	6	.86	.66	.20
			25	6	.86	.46	.40
			26	7	1.00	.40	.60
			27	6	.86	.46	.40
			28	24	3.43	1.83	1.6
			29	10	1.43	.83	.60
13-15	M	Fall	30	44	3.14	2.24	.90
			31	58	4.14	3.24	.90
			32	31	2.21	1.01	1.20
13-15	M	Spring	30	13	1.85	1.43	.42
			31	10	1.43	.61	.82
			32	25	3.57	1.97	1.60

CALCULATED MEAN DAILY THIAMINE INTAKE OF BOYS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
10-12	M	Fall	19	14	1.00	.50	.50
			20	12	.86	.56	.30
			21	12	.86	.26	.60
			22	11	.78	.48	.30
			23	32	2.28	1.88	.40
			24	16	1.14	.74	.40
			25	21	1.50	.50	1.00
			26	17	1.21	.31	.90
			27	16	1.14	.74	.40
			28	18	1.28	.78	.50
			29	21	1.50	1.20	.30
10-12	M	Spring	19	9	1.28	.68	.60
			20	6	.86	.46	.40
			21	7	1.00	.40	.60
			22	5	.71	.51	.20
			23	13	1.85	1.25	.60
			24	5	.71	.51	.20
			25	6	.86	.46	.40
			26	4	.57	.37	.20
			27	11	1.57	.77	.80
			28	14	2.00	1.20	.80
			29	6	.86	.26	.60
13-15	M	Fall	30	24	1.71	.81	.90
			31	31	2.21	1.71	.50
			32	22	1.57	1.07	.50
13-15	M	Spring	30	10	1.43	.75	.68
			31	8	1.20	.60	.60
			32	17	2.42	1.92	.50

CALCULATED MEAN DAILY NIACIN INTAKE OF BOYS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
10-12	M	Fall	19	122	8.71	3.91	4.80
			20	121	8.64	4.34	4.30
			21	131	9.35	3.65	5.70
			22	107	7.64	4.44	3.20
			23	185	13.21	8.91	4.30
			24	193	13.78	9.68	4.10
			25	125	9.00	5.50	3.50
			26	128	9.14	4.64	4.50
			27	135	9.64	5.34	4.30
			28	187	13.36	5.16	8.20
			29	167	11.93	7.63	4.30
10-12	M	Spring	19	77	11.00	5.20	5.80
			20	58	8.28	1.28	7.00
			21	137	19.57	10.97	8.60
			22	53	7.57	3.37	4.20
			23	167	23.86	14.86	9.00
			24	62	8.86	3.86	5.00
			25	71	10.14	5.74	4.40
			26	49	7.00	3.20	3.80
			27	51	7.28	2.28	5.00
			28	79	11.28	7.08	4.20
			29	126	18.00	13.60	4.40
13-15	M	Fall	30	272	19.42	13.42	6.00
			31	293	20.93	17.93	3.00
			32	288	20.57	12.37	8.20
13-15	M	Spring	30	121	20.57	13.97	6.60
			31	106	15.14	9.74	5.40
			32	100	14.28	8.08	6.20

CALCULATED MEAN DAILY ASCORBIC ACID INTAKE OF BOYS

Age Group	Sex	Season	Subject	Total Consumed	Average Per Day	Average Furnished by Home	Average Furnished by School
10-12	M	Fall	19	358	25.57	9.57	16.00
			20	273	19.50	7.80	11.70
			21	642	45.86	27.16	18.70
			22	343	24.50	12.50	12.00
			23	450	32.14	11.04	21.10
			24	584	41.71	24.51	17.20
			25	470	33.57	20.77	12.80
			26	478	34.14	30.44	3.70
			27	361	25.78	4.68	21.10
			28	359	25.64	9.08	16.60
			29	399	28.50	16.80	11.70
10-12	M	Spring	19	347	49.57	26.37	23.20
			20	246	35.14	17.14	18.00
			21	272	38.86	16.86	22.00
			22	172	24.57	16.47	8.10
			23	295	42.14	34.34	7.80
			24	243	30.43	8.23	22.20
			25	157	22.43	8.03	14.40
			26	168	24.00	6.80	17.20
			27	177	25.28	7.88	17.40
			28	515	73.57	41.77	31.80
			29	559	79.86	43.46	36.40
13-15	M	Fall	30	803	57.36	39.46	17.90
			31	384	27.43	7.83	19.60
			32	629	44.93	20.23	24.70
13-15	M	Spring	30	919	131.28	112.78	18.50
			31	606	86.57	64.37	22.20
			32	439	62.71	34.91	27.80

CHI SQUARE

The extent to which the child's diet was related to selected factors was measured by Chi square. The following formula was followed to determine Chi square.

$$\text{Ex. N} = \frac{\text{Column Total} \times \text{Line Total}}{\text{Total Number}}$$

$$D = \text{Obs} - \text{Ex. N.}$$

$$D^2 = d \times d$$

$$rd = \frac{d^2}{\text{Ex. N.}}$$

$$\chi^2 = \sum rd.$$

Obs = observed number

Ex. N. = frequency expected

D = deviation - (the difference between observed and expected values)

D^2 = deviation squared

rd = d^2 divided by Ex. N.

χ^2 = the sum of rd.

TABLE III

Relationship of Height-Weight Data of 32 Subjects to Nutritive Intake to Growth as Measured by the Use of the Wetzel-grid.

Classification of Diets	Clinical Ratings From Obese to Poor in Terms of Body Build							Total
	A ₄	A ₃ and A ₂	A ₁ MB	B ₂ and B ₃	B ₄			
Extremely Poor	obs. exp. D D ₂ rd	0 2.81 2.81 7.8961 2.81	1 1.125 .125 .01562 .0138	2 3.37 1.37 1.8769 .5569	4 3.09 .91 .8281 .2679	2 1.12 .88 .7744 .6912	9	
Very Poor	obs. exp. D. D ₂ rd	1 .406 .594 .352836 .8690	0 1.625 1.625 2.640625 1.625	5 4.875 .125 .015625 .00320	6 4.468 1.532 2.347024 .5252	1 1.625 .625 .390625 .2403	13	
Poor	obs. exp. D D ₂ rd	0 .3125 .3125 .097656 .312	3 1.250 1.750 3.0625 2.45	5 3.750 1.250 1.5625 .4166	1 3.437 2.437 5.93896 1.7279	1 1.25 .25 .0625 .05	10	
Average	obs. exp. D D ₂ rd	0	0	0	0	0	0	
Total		1	4	12	11	4	32	

$$X^2 = 12.5590$$

$$P \approx .05$$