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Study of the Nutritive Value and Acceptability of Hot and Cold Type A School Lunches

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STUDY OF THE NUTRITIVE VALUE AND ACCEPTABILITY OF HOT AND COLD TYPE A SCHOOL LUNCHES

BY

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ABSTRACT

The purpose of the study was to determine the differences, if any, between the nutritive value and acceptability of the Cold and Hot Type A School Lunches. The study involved all sixth-grade children in both public and non-public schools in the city of Central Falls, Rhode Island--a high population density, low-income area. A total of 1,965 meals consumed by 495 children (266 boys and 229 girls) were calculated for nutrient content. During Phase I, data were collected for a five-day period on the participation, waste, and nutritive value of a Cold Type A School Lunch available in public schools. This was compared with values for lunches eaten-at-home or brought-from-home by public and non-public school children. Since a hot lunch became available during the next school year, Phase II determined participation, waste, and nutritive value of the Hot Type A School Lunch. Observations were made for two five-day periods, and compared with data obtained during Phase I. Nutrient contents of the lunches and intakes of the children were determined by a computer program based on USDA Handbook No. 8 (84).

During the study, an average of 39 percent of the sixth-grade public school students obtained a Cold School Lunch which increased to 64 percent when the Hot School Lunch became available. None of the hot or cold school lunches contained the recommended goal of one-third of the RDA (88) for all nutrients, for boys and girls 11 to 14 years old.

Nutrient losses from plate waste were generally greater from the Cold School Lunch than from the Hot School Lunch. The average nutrient intake from the Hot School Lunch did not meet the goal of one-third of the RDA (88) but met one-fourth of the RDA (88) for boys and girls, for all nutrients except iron. The average nutrient intake from the Cold School Lunch was below the goal of supplying one-third of the RDA (88) for all nutrients. The average nutrient intake from Cold School Lunches was below one-fourth of the RDA (88) for energy, iron, vitamin A, and niacin for both sexes and for thiamin for girls.

Lunches eaten at home provided more calories, protein, fat, iron, vitamin A, and niacin than the Cold School Lunches. The intake of calcium for the girls and of ascorbic acid for the boys were higher in the Cold School Lunch. When compared with lunches brought from home, the boys who obtained the Cold School Lunches had higher intakes of calcium, vitamin A, riboflavin, and ascorbic acid. The girls choosing the Cold School Lunch also had higher intakes of calcium and ascorbic acid but lower intakes of calories, protein, fat, iron, thiamin, and niacin, than the girls who brought their lunches from home.

In general, the results of this study showed that for sixth-grade school children, Hot School Lunches were more nutritious than Cold School Lunches in terms of calories, protein, iron, vitamin A, thiamin, and niacin. Futhermore, almost twice as many hot school lunches were served as compared to cold school lunches. This indicates that initiation of the Hot School Lunch was an important factor in increasing student participation in the School Lunch Program.

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To my husband, may I express my gratitude for his encouragement, patience, and understanding.

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INTRODUCTION

As our Nation celebrated its 200th birthday, the National School Lunch Program marked 30 years of accomplishment in feeding the Nation's most important treasure, "Its Children." Aren't today's children, tomorrow's leaders? Thus the expressed intention of the National School Lunch Act of 1946 was as follows:

"...to safeguard the health and well-being of the Nation's children and to encourage the domestic consumption of nutritious agricultural commodities and other food, by assisting the States, through grants-in-aid and other means, in providing an adequate supply of foods and other facilities for the establishment, maintenance, operation, and expansion of non-profit school-lunch programs."

The School Lunch Program insures a minimum nutrient intake which, if other meals are calorically adequate, prevents at least the more severe deficiencies. The Type A School Lunch teaches the structure of a balanced meal. With so much of our adult mortality due to arthero-sclerosis, obesity, and diabetes, conditions whose causes have nutritional components, the School Lunch Program can and should be an important agent in preventive medicine (1).

In the late 1960's, Americans were shocked to realize that hunger and malnutrition were not confined to distant lands (2, 3). In 1968, the goal that all American children, no matter what their family's income level, have access to good food at school had not been fully reached (4). In the 1974-75 school year, 4.4 million children were still left out of the National School Lunch Program. Progress has been made but there were still in 1974, 16,516 schools with no lunch program (5).

Bard (6) has noted:

"While the needy and hungry child poses a compelling and dramatic challenge to the nation, the undernourished middle income child who might equally benefit from the school lunch poses a nagging problem."

"The School Food Service Programs have to reach the deprived child who has been left out and also the advantaged child who leaves himself out. The School Lunch Program is not only good for some children, it is good for all children, and essential to many," said Assistant Secretary of Agriculture, George L. Mehren in 1968 (6).

Many factors were impeding wider development of a school lunch program. Some of these were as follows:

1. Antipathy towards federal aid.
2. A belief that in a neighborhood school a child should go home to lunch.
3. The philosophy that the program must be financially self-sustaining.
4. Lack of fund support by local communities.

At the present time, when new schools are built, provisions are made, in most instances, for school food service. However, thousands of older urban and rural schools are still not participating in the National School Lunch Program because installation of kitchen and dining facilities is not feasible. This means that nutritionally needy children in these schools, many in low-income neighborhoods do not have access to the National School Lunch Program benefits. To reach these schools, the use of central and satellite kitchens, canned and frozen lunches, new and convenient foods, and bag lunches could be successfully applied.

According to a Battelle study, a cold lunch program is the easiest to start (7). The advocates of the bag lunch program have to overcome a strong stigma attached to the term "cold lunch" (6). Even if the "psychological" benefits associated with serving hot food are more imaginary than real, the public continues to demand and expect that hot meals be served to the school children.

This study compares the Nutritive Value and Acceptability Between the Hot and Cold Type A School Lunch served in Central Falls, R. I., in 1974 to 1975. If cold lunches are nutritionally adequate and acceptable, they may offer a solution to the following problems that school feeding faces:

1. To feed children in areas where no food facilities exist.
2. To increase the participation of children who are not eating the school lunch offered to them.
3. To keep the cost of lunches at a minimum.
4. To use the moneys allotted to school feeding in a most efficient way, so that all schools could participate.
5. To use existing facilities in their most profitable capacity.

PURPOSE OF THE STUDY

The purpose of this study was to determine:

1. The difference between the nutritive value of a Cold Type A School Lunch and that of a Hot Type A School Lunch which was served to the sixth-grade children of Central Falls, Rhode Island, in 1974 to 1975.
2. The difference in the kind and quantity of the nutrients consumed by the sixth-grade children from the Hot and Cold Type A School Lunches.
3. The acceptability of a Cold versus a Hot Type A School Lunch in terms of plate waste and participation by the sixth-grade children.
4. The difference between the nutritive value of lunches eaten at home, brought from home, and those served in the School Lunch Program.
5. The difference between the nutritive value of lunches consumed by sixth-grade children who paid for their lunches, who received their lunches free or at a reduced-price.

JUSTIFICATION OF THE STUDY

In 1946, the National School Lunch Act was passed by the Seventy-ninth Congress. When a state-wide school lunch program was mandated in Rhode Island by State Legislation on May 2, 1972, many schools were lacking physical facilities necessary for serving a hot lunch. Until this situation could be remedied, a Cold Type A School Lunch was initiated in Central Falls, Rhode Island. This created the setting for studying the overall value of different types of school lunches in one community in the United States. The importance of evaluating the various types of programs is evident from the fact that the present school lunch program involves 25,857,000 children at a cost of 1.4 billion dollars in 1976.

SCOPE AND LIMITATIONS OF THE STUDY

All students were told that the study was being conducted. They were asked to act as usual. Their behavior based on my previous observation of the lunch period and on the observation of the school personnel and of the State Lunch Aides, was judged representative of the everyday situation.

A five-day study was conducted because the school authorities, State Lunch Aides and students were happy with a week long project. They would have been reluctant to have participated in a longer investigation because of the extra work involved.

The investigation was conducted with the students of the sixth-grade only, because of time and space limitations. Sixth-grade students were chosen because the kinds and amounts of foods in the Type A School Lunch pattern are based on the nutritional needs of 9 to 12-year-old children.

Another limitation was that the nutrient content of the food consumed was calculated rather than analyzed. This last method would have been too expensive and time consuming, even though several reports in the literature point out the discrepancy which may occur between calculated and analyzed nutritive values for meals (8, 9, 10, 11, 12, 13).

II. REVIEW OF RELATED LITERATURE

Hunger and Malnutrition in U.S.A.

Several years ago, the late Robert Kennedy knelt to touch a child sick from hunger in a dirt yard in Mississippi. This was the beginning of massive publicity, Congressional Committee hearings (14), a White House Conference on Food, Nutrition, and Health (15) and a Poor People's campaign that pointed out the "undiscovered or ignored" existence of hunger and malnutrition in this country (16). Two reports have especially received considerable, nation-wide attention. The first was the report of the Citizens' Board of Inquiry into Hunger and Malnutrition in the United States entitled "Hunger--U.S.A." (2). The second was "Hunger in America," a television production by the Columbia Broadcasting System, presented nationally on May 5, 1968. Striking in their emotional appeal, both reports were the results of eye-witness accounts of a Senate Subcommittee touring Mississippi and of the widely reported statements of six doctors who, upon returning from Mississippi, reported they had personally observed inhuman and intolerable conditions.

The Citizens' Crusade Against Poverty established a twenty-four member independent board in July 1967, to inquire about the extent of hunger and malnutrition in our nation. According to their 1968 report, more than 14 million Americans from all over the country were going to bed every night without enough food to keep them healthy. Disease such as kwashiorkor, murasmus, pellagra, and beri-beri, as found in developing countries were thought to be present in the U. S. American children were found to suffer from scurvy, rickets, hookworms, roundworms, parasitic infections, and anemia. They also stated that the Federal Government through the Commodities Distribution and Food Stamps Programs failed to reach the majority of the poor, since only 5.4 million persons or 18 percent of the 29.9 million poor were receiving food stamps or surplus commodities. It is likely that as many as 33 percent of the 5.4 million individuals participating in these food programs had what USDA defined as a "poor" diet. The School Lunch Program, reached only 2 of the 6 million children of poor families, and most of those reached were not among the poorest of our children (2).

USDA Food Consumption Survey, 1965

In the spring of 1965, the Department of Agriculture conducted a nationwide study of the food consumption of 7,500 households (17). Only about half of the households, compared to 60 percent reported in the 1955 Survey, had diets which met the Recommended Dietary Allowances (RDA) for all of the seven nutrients studied (18). According to this USDA survey, 10 million Americans in poverty were eating a poor diet, and over 19 million were not maintaining a "satisfactory" diet because they could not afford the costs of food. In general, the higher the income of a family, the better the diet. However, high income does not assure a good diet, nor low income a poor diet. Nine percent of the families with incomes of 10 thousand dollars or more had diets rated as poor, while 37 percent of those with income lower than 3 thousand dollars had diets rated as good. Diets of 39 percent of the low-income families, were below the RDA in 2 or more nutrients as compared to 21 percent of the higher income group. Calcium, vitamin A, and ascorbic acid were the nutrients most often found to be low. Average calcium consumption was above the RDA recommendations for children under 9 years but below the RDA for all groups of females over 9 years. Iron was often below recommended allowances, particularly for infants and children under 3 years, girls and women between 9 to 54 years, and boys 12 to 14 years (17).

Ten-State Nutrition Survey, 1968-1970

In 1967, the Congress directed the Department of Health, Education, and Welfare to determine the scope and location of malnutrition and related health problems in this country. A survey was conducted in ten states and New York City, selected as geographically representative of the major areas of the country, and of the broad diversity of economic, ethnic, and socio-cultural composition. Demographic data were obtained on 24,000 families containing 86,000 persons. The evaluation of nutritional status involved approximately 40,000 individuals. Results of the Ten-State Nutrition Survey indicated that a significant proportion of the population surveyed was malnourished or was at high risk of developing nutritional problems (19). However, malnutrition in different segments of the population varied in severity and in regard to the specific nutrients involved. The findings show that the characteristics of malnutrition are often unique to the local situation and to the specific subsegment of the population being surveyed. Nutrition education programs should then be custom-made for each group (20).

Although income was a major determinant of nutritional status, nutritional problems were not confined to just the lowest-income populations surveyed. It was shown that the greatest emphasis should be directed at low-income populations, however, because of the relative severity and prevalence of problems in that group. Other factors such as social, cultural, and geographical also had an effect on the level of nutrition of a population group. Adolescents between the ages of 10 and 16 years had the highest prevalence of unsatisfactory nutritional status. Between-meal snacks of high carbohydrate foods such as candies, soft drinks, and pastries were associated with the development of dental caries in adolescence.

There was evidence that many persons made poor food choices that represented unwise use of the money available for food. For example, 80 percent of households reported never using powdered skim milk as a beverage. In many diets, there was heavy emphasis on meats over more economical sources of protein such as fish, poultry, legumes, and nuts. Many households seldom used foods rich in vitamin A, and many diets were deficient in iron content. Although vitamin C was not a major problem, the prevalence of poor vitamin C status could increase with age. Obesity was found to be highly prevalent in adult women, particularly black women. Men were less frequently obese, although white males had a relatively high prevalence of obesity when compared with black males.

School lunches were found to be a very important part of nourishment for many children. Particularly in the low-income-ratio states, school lunches contributed a substantial proportion of the total nutrient intake of many school children. The contribution of the school lunch to overall nutrition was particularly important among black children.

First Health and Nutrition Examination Survey, United States, 1971-1972 (HANES)

The HANES Program was undertaken by the National Center for Health Statistics in response to a directive from the Secretary, Department of Health, Education, and Welfare to establish a continuing national nutrition surveillance system (21). This system had as its purposes the measuring of nutritional status of the population of the United States and monitoring the changes in this status over time. Preliminary dietary intake and biochemical test findings, among individuals 1 to 74 years of age in the non-institutionalized population of the United States, showed evidence of a low intake of iron, which occurred at all age levels and was not limited to persons in the below poverty level group. All age-groups for both race and income levels had calcium and vitamins A and C intakes that either approached (90 to 100 percent of the standards) or were above the standards set by the HANES Study, except: Negro females of ages 18-44 years of both income levels who had inadequate mean calcium intakes of 20 to 23 percent below the standard, and white females of the same ages in the lower income group who had mean vitamin A intakes 18 percent below the standard.

Nutritional Intake of Children

Children of school age have long been recognized as a nutritionally vulnerable group, because of their increased nutritional requirements in relation to their weight due to growth (19, 21, 22). A study of 418 high school students in Montana, showed that 78 percent of the girls and 40 percent of the males consumed diets which provided less than two-thirds of the RDA (23) for one or more nutrients. The most important finding of this study was the vitamin C inadequacy (24). Similar results were found with Idaho children, 15 and 16 years of age, who consumed diets containing less than one-half of the RDA (25) for vitamins A and C (26). Beal (27) reported that 75 percent of Colorado children studied had inadequate intakes of iron, and only 25 percent met the allowance for niacin.

Trulson et al. (28) surveyed 4,881 New York Public School children in the fourth and tenth grade. Evidence obtained from this survey indicated that 25 percent of the children did not meet the RDA (25) for protein, 50 percent did not have a daily serving of vitamin C, and 10 percent had symptoms associated with poor nutrition. Several studies (29, 30, 31) have reported on the nutritional status and the nutritive value of the diets of 1,188 Iowa school children. Generally, the diets were found to be lacking in calcium and iron. Girls, after the age of 12, usually consumed diets below the allowance levels for most nutrients. Wharton (32) found from a study of 421 adolescent boys and girls from a depressed area, that the younger students consumed less than two-thirds of the RDA (33). Of the older boys and girls, 43 percent of the boys and 55 percent of the girls had less than two-thirds of the RDA (33).

Myers et al. (34) in 1968 studied 332, 9 through 13 year-old students in two elementary schools in a depressed section of Boston. The schools involved in this study had no lunch facilities, and the children were not permitted to leave at noon. Consequently, the children were supposed to bring their lunches from home. Results indicated a need for concern about the nutritional intakes of economically deprived children living in urban situations.

History of School Feeding

During the nineteenth century, popular education on a large scale was initiated. The fact that many industrial area children of the working classes were unhealthy, stunted in growth, malnourished, poorly clad became abundantly evident. A sense of social responsibility on the part of teachers, philanthropists, and ministers of religion soon developed. This led to initiation of the earliest school feeding programs in the United States by voluntary societies and women's clubs. The programs were confined to cities (22).

In 1853, the Children's Aid Society of New York City founded an industrial school and provided a free noon meal for its pupils, hoping to keep the students in school until the end of the program (35). Ellen A. Richards began school feedings in 1894, in Boston. The progress of school feeding programs was quite slow until the advent of the "Penny Lunch" (1). In 1907, the Women's Educational and Industrial Union was providing lunches at the cost of a penny for Boston children who could afford it and free for those who could not. Philadelphia soon followed suit with "penny lunches." Other large cities such as New York, Cleveland, Cincinnati, Rochester, Chicago, and Louisville started to emulate Boston. Meals consisted of a single dish, such as soup with crackers, baked beans, stew, rice pudding, or a sandwich, all served with milk (35).

The advent of World War I accelerated the growth of the school lunch movement. As enlistees and draftees pressed into the examination rooms, the effects of malnutrition, were visible in a large number. The resulting public outcry was seen as pressure on local authorities to feed school children (1).

The present structure of the school lunch program dates essentially from the Depression Years. With undernourishment a serious visible threat to the nation, the Federal Government started the allotment of government surplus food to school cafeterias (36). The 1935 Public Law 320, Section 32, approved by the Seventy-fourth Congress formalized the channeling of food commodities into school lunchrooms. The use of commodities purchased by the Department of Agriculture and distributed free to the schools, financially helped local communities to support their cafeterias and to open new lunch facilities. All were enabled to serve nutritionally better lunches at a lower cost to the student.

The dramatic increase in employment brought about by World War II decreased the need for emergency relief operations. At the same time, agrigultural commodities once plentiful, became scarce. To compensate for the loss of commodities during the war, the Secretary reimbursed the schools in cash for the purchase of commodities.

School Lunch Act

The National School Lunch Program was established under the National School Lunch Act passed by the Seventy-ninth Congress on June 3, 1946. Amendents followed in 1952, 1962, 1968, 1970, 1973, 1975, 1976, and 1977. The National School Lunch Program is administered by the United States Department of Agriculture through its Food and Nutrition Service, formerly the Consumer and Marketing Service in cooperation with the State Department of Education, Division of School Food Service.

Regulations for Participation

Individual schools must apply to the State Department of Education to become eligible to participate in the program. They must agree to the following regulations and restrictions governing reimbursement:

1. Operate the program on a non-profit basis.
2. Provide free or reduced-price lunches to needy children who must not be identified, nor otherwise discriminated against in any way.
3. Serve meals that meet the nutritional standards established by the secretary of Agriculture for the Type A School Lunch.

4. Follow the state health and sanitation regulations and maintain full and accurate records on the food service operation.

5. Charge 20 cents as the maximum price for a reduced-price lunch.

Type A School Lunch Pattern

Originally this lunch had to contain as a minimum the following:

1. Two ounces of lean meat, poultry, fish, or cheese; or one egg; or an equivalent substitute.

2. Three-quarters cup serving of two or more vegetables or fruits or both.

3. One serving or one slice of whole grain or enriched bread or equivalent.

4. Two teaspoons of butter or fortified margarine.

5. One half pint fluid milk as a beverage.

Other foods, not part of the lunch requirement could be added, as needed to complete lunches, to help improve acceptability and to provide additional food energy and other nutrients.

It was recommended that lunches include: A vitamin A vegetable or fruit at least twice a week; A vitamin C vegetable or fruit twice a week; Several foods for iron each day. It was also recommended that fat in the Type A lunch be kept to a moderate level and iodized salt be used in preparing lunches (37). The butter-margarine component has now been removed from the requirements.

As a result of legislation enacted October 7, 1975, senior high school students now have a latitude of choice within the Type A School Lunch pattern. Senior high school students must be offered all five food items contained within the four food components of the Type A School Lunch. However, such students can now choose any 3, 4, or 5 of the 5 required food items offered. The student will still receive the meal free, at a reduced-price, or at the regular price.

As Public Law 95-166 was passed on November 10, 1977, several more changes have been made to the Type A School Lunch pattern. Principle changes do the following:

1. Specify minimum quantities of food appropriate for five age groups. (I=1-2 yrs.; II=3, 4, 5; III=6, 7, 8; IV=9, 10, 11; V=12+)
2. Require service of lunch to preschool ages 1-5 at two service periods, which in combination will meet requirements.
3. Expand bread alternatives to include enriched or whole-grain rice, macaroni, noodles, and other pasta products.
4. Specify number or servings of bread/bread alternatives to be served for the week to provide added flexibility in menu planning.
5. Dry beans or peanut butter can be used only as one half of the meat/meat alternative.
6. Eggs can be used only to meet one half of the meat/meat alternative for child age three plus; egg can be used to meet meat requirements fully for child age one to two.
7. Eggs, cooked dry beans or peas, and peanut butter can be used as one half fullfillment with meat, or in combination with each other.
8. Children age twelve plus can request smaller portions than offered, to meet their needs and to reduce waste.
9. Unflavored fluid lowfat milk, skim milk, buttermilk must be available in addition to whole milk.

Federal Cash Assistance

Under this program, the Federal Government provides cash reimbursement to states, in addition to the available surplus commodities, which may range from a fraction of a cent to 14.5 cents per paid-in-full lunch. For every dollar contributed by the Federal government, three dollars must be provided by the State, but only for the paid-in-full lunches since Public Law 94-105 on October 7, 1975. Children's payments are credited toward State matching funds and are the single most important contribution to the program. In round estimates, the Federal Government pays about 33 percent of the total cost of the School Lunch Program and the State and local governments put in roughly another 23 percent. The remaining 44 percent comes from the payments of the children who pay for their lunches. Funds are apportioned among the states on the basis of a complex formula that takes into account the number of school-age children in the state, per-capita income within the state, and the participation rates within the states. States with lower incomes and or high proportions of free lunches may receive additional assistance. States do not have to match the commodities received.

Commodities Assistance

The amount of donated commodities allocated to schools within a state is based on student participation in the program the previous year (38). There are three types of commodities available:

1. Surplus commodities. Surplus farm commodities purchased with funds from customs receipts imported foods.

2. Price-supported commodities. Basic agriculture products purchased with funds appropriated for price support.

3. Special commodities purchased solely for the school lunch program to provide variety and increase the nutritional value of the lunch. Food presently distributed include frozen and canned meat and poultry items, eggs, and a variety of canned fruits and vegetables that are especially suited for children's lunches.

In 1978, the cash values of commodities has been established to 12 3/4 cents per meal.

FREE AND REDUCED-PRICE SCHOOL LUNCHES

The National School Lunch Program actually uses the criteria "family income and size" to determine the eligibility of children to receive free or reduced-price lunches. Children who pay for their lunches are asked a price that defrays local costs. Children are identified as eligible for free lunches according to economic criteria established annually by the Secretary of Agriculture, and for reduced-price lunches according to criteria established by individual states or school districts.(39).

Free or reduced-price school lunches might be viewed not only as another form of income maintenance for poor families but also as an effort to provide a nutritious noon meal for children who need nutritional supplementation. Poor diets occur more frequently in, but are not limited to, low income families, as shown in the USDA Household Survey (17). Leverton (40) has also pointed out: "It is also possible for a child to be poorly fed and malnourished because of poor food habits and lack of home supervision, even though he comes from a middle-class or affluent home."

In 1968, an in-depth study of the nature, dimension and failures of the National School Lunch Program was published in "Their Daily Bread" (4). Five national women's organizations, with religious affiliations, conducted interviews with school administrators, principals, teachers, food service managers, and visited schools in order to find why the school lunch was not meeting the needs of poor children. They reported: "Of 50 million school children, fewer than two million, just under 4 percent are able to get a free or reduced-price school lunch. Whether or not a child is eligible for a free lunch is determined not by any universally accepted formula but by local decisions about administrations and financing which may or may not have anything to do with the need of the individual child. And generally speaking, the greater the need of children from a poor neighborhood, the less the community is about to meet it (4). As a result of this study, a National Commission was appointed to sponsor free food service programs to poor children. Reforms in the National School Lunch Program were signed into Public Law 91-248 in May 1970. The law states that school officials must: "Develop and publicly announce eligibility standards for free and reduced-price lunches...and no later than January 1, 1971, serve free and reduced-price lunches to children from families with incomes at or below annual income poverty guidelines established by the Secretary of Agriculture...and to strengthen procedures to protect the anonymity of the children who receive free and reduced-price lunches" (41). It is also required that a public announcement of the availability and criteria for such meals be made at least once a year through the mass media and through a letter sent to the home of the parents. Applications for such meals must include simple statements of family income, family size, and hardship factors (38).

Massachusetts surveyed 80,000 of its public school children, grades one to twelve, in a statewide nutritional survey conducted in October, 1969. Lack of money was a problem with some children. Four percent said that the Type A meal cost too much (42). In 1971, Paige (43) reported that by ignoring simple medical indices in favor of family income or impressionistic considerations by school officials, many nutritionally indigent youngsters are excluded from participating in the school feeding program. In Baltimore, major emphasis was placed on increasing the number of children who were participating in the school feeding program by the Mayor and appointed Nutrition Task Force. The number of free lunches jumped from approximately 5,000 to over 50,000 within one year. In spite of this sincere and dedicated effort, significant numbers of children with medical indices of poor nutrition, as judged by anthropometrics and/or hematocrits, failed to participate in the school feeding program. Seven hundred forty-two children from first, second, and sixth grades in four schools were screened. Over 25 percent of the youngsters in the first grade having hematocrits below 36.0 mg. percent were not included in any school feeding program. Forty-two percent of the first grade children with as critical hematocrit level of 33.9 mg. percent were not participating in a food project. Forty-nine percent of the children in the first and second grades who showed medical evidence of poor nutrition by height and weight, were not included in the school lunch program. The problem appeared to be that all children meeting arbitrary financial eligibility criteria at a given point in time were the same children with evidence of medical indices or poor nutrition. Two criteria, socio-economic and medical indices, were found to be necessary in selecting those children most in need of participating in an organized school feeding program. Insufficient attention was given to large numbers of children whose names did not appear, or who were temporarily off welfare rolls. The lack of cafeteria facilities, and inadequate funding of these programs forced school systems to include only a portion of children in school feeding programs.

Another study, the "Lunch Bunch Study" was conducted by Emmons et al. (39, 44) and included 844 elementary school children from Upstate New York school districts. Parents were asked to fill specially designed questionnaires, to ascertain whether the children were "eligible" or "ineligible" for free school lunches. A combination of anthropometric and biochemical data were collected. Dietary intakes by 24-hour recalls were provided by the children during individual interviews. The diets were analyzed by computer, and nutrient contribution of home and school meals were recorded separately. Using the current family-size income eligibility criteria, scarcely one-third of the children identified as nutritionally needy were eligible for free school lunches. If the primary purpose of the free school lunch program was to identify and serve children most in need of the nutritional supplementation afforded by school lunches, then these children needed to be identified by nutritional rather than economic criteria.

School lunches alone may be insufficient to overcome nutritional deficiencies in the child's home diet. Another meal at school, such as Type A breakfast might be considered. Or, alternatively, the child's home diet might be improved through Family Food Assistance programs and/or nutrition education programs. Thus, Emmons et al. (39, 44) concluded as Paige (43) did, that "to identify children whose diets need improvement, it would be preferable to use nutritional and economic criteria.

Legislation has been introduced in the Congress that would provide all school children with free lunches--the way they receive free books. The future seems to lean this way.

HOT VERSUS COLD SCHOOL LUNCHES

Since it was established in 1946, the National School Lunch Program has served either hot or cold Type A lunches to the children of this country. Usually, cold lunches have been accepted on a temporary basis, because the public expects hot meals to be provided in a school feeding program. Recommendations that hot lunches be provided for the needy were made by Congressman Perkins at the American School Food Service Association convention in Las Vegas (45), by a Task Force of the

White House Conference (15) and by Senator Hart. The Parents Teachers' Association, from its beginning, has recommended that hot lunches be served in schools. However, these pressures combined with the lack of facilities in schools and lack of funds have left many schools especially in big cities and in rural areas without any kind of food service. No scientific research, yet, has demonstrated the nutritional superiority of the hot lunch over the cold one. Only one study has been found on acceptance of the hot and cold lunches (46).

A Gallup survey in 1968 sampled 1,500 people covering four regions of the country. They found that hot lunches were generally favored over the cold ones, especially by men. Women preferred lighter cold lunches, while men liked hearty hot meals. Younger people from low and middle incomes, enjoyed a cold sandwich with potato chips and beverage as much as the complete hot lunch (47). Augustine et al. (48) had earlier found that, students liked sandwiches.

Cold school lunches were served on a temporary basis in 1968 in the Detroit Public schools (46). The Philadelphia School System, in 1967, was satelliting 5 different types of lunches from a central kitchen, including individual hot lunches, hot bulk food, Vita-Pak cold lunches, Jet Pak which is a combination of hot and cold lunch and an a la carte lunch. Martin (46) compared the attitudes of Pennsylvania elementary and junior high school students toward hot and cold lunches and related these attitudes to the acceptability of the lunches. She found hot lunches were better accepted than cold ones because more of the hot lunches were consumed on the basis of total plate waste relative to the amount served. Hot lunches also provided higher intakes of energy, protein, and iron than the cold lunches. "However, even after a consideration of the loss of nutrients in plate waste from cold lunches, the intakes of nutrients were still acceptable, i.e., above one-third the recommended allowances in almost all cases. Thus, the cold lunch program can be recommended as an acceptable means of providing children with adequate nutritional intakes, and one that the expressed preferences of children indicate as being equally satisfactory as the hot lunch program (46)."

Law et al. (49) when they studied the sophomore high school students attitudes toward school lunch, found that, "Most parents agreed that they wanted their children to eat at school because it provided a hot meal and was good for health."

The use of a "box lunch" has been successfully used to raise high school participation in the National School Lunch Program, by as much as 50 to 60 percent, without detracting from the regular plate lunch service, and where kitchen and cafeterias could not handle a greater number of hot plate lunches (50, 51).

Home Versus Type A Lunches

Bard (6) has reported in "Their Daily Bread" that:

> In West Virginia, only one in twenty home-packed lunches in the mid-1940's was found to be "health building." In Kansas, a study showed that more than half the girls of high school age drank less than a glass of milk daily. Some 90 percent enjoyed "less than a helping of green or yellow vegetables" in their daily diet. Intake of protein, calcium, and iron was universally "inadequate." He also reported that: "Boston served lunch only in junior and senior high schools but had no lunchrooms in its 160 elementary schools. Children were permitted to bring a bag-lunch, but many of their home-packed meals are poorly chosen, according to Assistant Schools Superintendent, Marguerite Sullivan. "Some children come to school without lunch," she said, "the others are most generous about sharing."

Callahan (42), in a state wide survey of Massachussetts students, grades one to twelve, concluded that children participating in Type A School Lunch fared the best. Seventy-two percent of these ate an adequate lunch on the day of survey. Mothers did not do as well at home; 72 percent of the children eating at home had an inadequate lunch. Nor did the mothers pack an equivalent lunch in the brown paper bag; 58 percent of these lunches were inadequate. Over three-fourths of the students buying a la carte items in school, and almost 80 percent of those patronizing neighborhood stores, ate an inadequate meal. Although the lunches were poor as a source of either vitamin A or C in all types under study, the Type A lunch surpassed all others. Thirty-three percent of the children eating a Type A lunch received a source of vitamin A compared to an average of only 5 percent for all other types. Twenty-eight percent of the children eating a Type A lunch ate a food rich in vitamin C, compared to an average of only 11 percent for all other types of meals.

Children attending schools located in a low economic area did not have lunches which scored as high as those attending schools in higher income areas. Only 50 percent ate an adequate meal as compared to 53 percent of the other children. This 3 percent represented almost 6,600 children. An additional one percent of 2,200 children went without lunch. However, if these children ate the Type A Lunch, the percentage consuming an adequate meal was exactly the same, 72 percent, as those attending schools from higher economic areas.

Emmons et al. (44) found that, of the elementary school children who brought bag lunches from home prior to testing in the fall of 1970, 56 percent bought milk at school and 15 percent brought milk from home. Nevertheless, when the nutritive content of school and bag lunches was compared, school lunches provided significantly higher levels of all nutrients except kcalories, and niacin equivalents; these differences were most pronounced in protein, calcium, vitamin A, riboflavin and ascorbic acid. School breakfasts provided significantly higher levels of all nutrients studied than school milk supplemented by snacks brought from home. Over one-fourth of the children's allowances for protein, calcium, thiamin, riboflavin, and ascorbic acid were supplied by the school breakfasts.

In District A, the 24-hour intakes of needy children in the spring were significantly higher in all nutrients, except vitamin A, than in the fall. Approximately one-quarter of the increases came from school lunches and morning milk. In District B, nutritionally needy children had significantly higher levels of all nutrients in their 24-hour diets, in the spring. School breakfasts and lunches together provided three-quarters or more of the increased nutrients.

Boysen and Ahrens (52) studied two second-grade classes in suburban Maryland. They reported that, the quality of lunches brought from home was poor, and the waste of certain items, in both home and school lunches, was high. One-fourth or more of the students had no milk with their lunch even though it was available for purchase at four cents for one half-pint. One-half or more brought no fruit, yet two-thirds usually had cake or cookies. Very few students, 10 percent or less had vegetables in their home lunches. In spite of the fact that school lunch offerings were often disliked, children buying school lunches tended to consume more adequate lunches than did children bringing home lunches. Between 9 to 18 percent of the children had an adequate lunch from home compared to 22 percent to 43 percent of the children eating an adequate school lunch.

A survey by the National Youth Advisory Council of the American School Food Service Association compared cost of a typical cold Type A school lunch with preparing an identical brown-bag meal with purchases at a local grocery store. In the seven states surveyed, the home-prepared meals averaged 10 to 15 cents more than lunches bought at school. The purpose of the survey was "to show the American teenager and parent that it does pay to buy nutritious school lunches. More importantly, parents must remember they are taxpayers, and part of federal, state, and local taxes support school lunch programs in their own communities. Therefore, depending on the state and local tax structure, there were additional costs not included in this minisurvey. Also, no costs have been added for time and labor." One must also remember that, with brown-bag lunches, "many mothers would substitute non-nutritious foods, such as diet beverages and other snack items, for the milk and vegetable components of the lunch" (53).

Nutritional Value of Type A Lunch

The Type A lunch pattern was designed for planning lunches that provide one-third of the RDA for 9 to 12 year-old children. Meyer et al. (9) were the first to give a complete report on the nutritive value of school lunches as determined by actual chemical analyses. Lunches as served to fourth and sixth-grade children, provided sufficient calories, 721 or one-third of the RDA (25), to meet the needs of the normal child. The fat content of the lunches was 29.4 gm. on the average, but varied tremendously from one school to the other. At least 30 percent of the calories were contributed by the fat. The average value of 27.1 gm. of proteins provided more than the 23 gm. specified in the RDA (25). The calcium content of most of the meals approximated the 0.4 gm. or one-third of the RDA. Only one-third of the lunches contained one-third of the RDA for thiamin. Differences in the thiamin values in the meals appeared to be due both to type of food and size of serving used for the main dish. All meals supplied more than one-third of the RDA (25) for riboflavin. About half of the meals contained one-third of the RDA (25) for ascorbic acid. The importance of the half-pint of whole milk as beverage was evident because it contributed 25 percent of the calories, 30 percent of the protein, 60 percent of the calcium, 25 percent of the thiamin, and 50 percent of the riboflavin in the complete meals.

In a 1963-64 study in South Louisiana, Metzinger et al. (54) calculated data for amounts of foods as served to 5,000 children aged 9 to 12 years. The average lunch contained 1,109 kcal. It was of interest that the lunches included 66 gm. of fat, which furnished 54 percent of the total calories. The percentage of total calories from saturated fatty acids was 24 percent and from polyunsaturated fatty acids was 27 percent. The P/S ratio averaged 0.32. These figures are higher than Meyer's et al. (61) and those reported later by Murphy et al. (55).

In 1966 the U. S. Department of Agriculture contracted a nation-wide survey of 300 schools, to determine the nutritive value of school lunches as served to sixth-grade students, and to evaluate the effectiveness of the Type A pattern in meeting the nutritional needs of 9 to 12 year-old children. A twenty-lunch sample was collected from each school and laboratory analyses were made of the nutritive content. The investigators (55, 56, 57, 58, 59) concluded that lunches based on the Type A pattern generally provided or approached the goal of one-third of the RDA (60, 61). In nearly 90 percent of the lunches, fat furnished between 33 and 44 percent of the energy. As a result of this finding, the Type A pattern was revised to decrease the butter or margarine requirement from 2 to 1 teaspoon.

Of 15 schools from North Carolina included in the USDA survey, 13 served food which provided less than one-third of the caloric and magnesium allowances; 11 were low in vitamin B_6; 9 in iron; and 7 in vitamin A. These shortages were relatively typical of these found throughout the total sample, except that in the total sample, one-quarter to one-half of the schools served less than the recommended amounts of thiamin (8).

After studying lunches in 21 schools throughout North Carolina, Head et al. (13) concluded that relative to the type A goal of serving one-third of the RDA, the meals as served were inadequate in calories and a high proportion were low in ascorbic acid and iron. There was also a problem, but to a less extent, with vitamin A. In no case was the goal for calories reached in the analyzed values of meals as served. The calculated level reached the goal in only about two-thirds of the schools. Also of concern was the fact that 43 percent of calories came from fat on the average; in 13 percent of the composites, over 50 percent of the calories were from fat. This was a higher percentage than the mean percentage of 38.8 kcal. from fat found in the 300-school nationwide survey (55). In general, nutritive values in secondary school meals were considerably lower in calories, protein, thiamin, ascorbic acid, calcium, and iron than those reported by Lewis and Bachemin (8) and similiar to those of Doucette (62) except in iron and ascorbic acid. Energy values of elementary school meals in this study averaged 80 kcal. lower than those in the USDA study. Thiamin levels were 9 percent lower, and iron about 10 percent higher than those reported by the USDA study (57).

Participation In The School Lunch Program

The National School Lunch Program, one of the largest Federal efforts in the field of public health, was important in the nutrition of 80 percent of the nation's children in 1974. Since the first year of the program, the number of children taking part has grown from 6.6 million to 25.9 million in 1976. As a result of the emphasis on feeding needy children in the legislation signed into law in May 1970, an unprecedented 7.3 million needy youngsters were reached with free and reduced-price meals in both April and May 1971. In 1976, Rhode Island had 395 schools participating in the National School Lunch Program, with 89,000 pupils eating Type A lunches. This figure represents 46.9 percent of the total enrollment compared to the national figure of 57.3 percent (5).

In the 1974-75 school year, there were 50,048,237 children attending all the schools in the United States. The National School Lunch Program was available to 43,499,837 children, the largest number in the history of the program (63). Even more children than that figure represents, were reached because all children do not participate on any single day. A total of 85,053 schools or 79.5 percent of all United States schools were participating in the National School Lunch Program in October 1974, and these schools enrolled 87.2 percent of the total student population.

On a national basis in 1974, there were two groups "outside" the child nutrition programs. The first group, nearly 4.4 million children nationwide, attended schools without food service. Of these, 2.6 million children attended schools which operated the Special Milk Program. Among these children, there certainly were many who would be eligible for free or reduced-price meals. The second group of "unreached" children, is those who do not take advantage of the lunch bargain available to them in participating schools.

A high priority has been placed on making school lunches accessible to all children. In recent years, such organizations as the United States Jaycees, the American Medical Association and Auxillary Nutrition Committee, the American Legion and the United States Catholic Conference have joined in the national effort to "get lunches to children." In many instances, it was a matter of selling the school administrator and the local school board on the advantages of child nutrition programs. (63).

While it had been thought that closed campus was the most important factor in high participation, study results show that it is not. Sixty-four percent of the students from all ten low-participation schools reported never eating the Type A lunch at all. Eighty percent of the high participation schools had limited a la carte arrangements, and the Type A School Lunch was obviously chosen as a better buy than the sum of its parts a la carte (63).

Parker (64) has reported that between 1964 and 1967, the percentages of School Lunch Programs operating at losses increased from 28 to 47 in five states. Average cash reimbursement to schools decreased from 9 cents a lunch to either 8.4 or less than 5 cents. Also the average lunch charge to students increased only 7 cents between 1950 and 1967. Thus, feeding programs had to face a much higher increase in costs of food and labor than they have been able to transfer to the price of the lunch. Financial problems have forced schools to close their cafeterias, and children were left out (6).

There is evidence that the middle-income child is gradually withdrawing from participation in the National School Lunch Program. The number of free and reduced-price meals is, however, on the increase. As the price of the lunch has risen because of the present economic criteria, more children find that their families cannot afford to have them enjoy the meal at school (38).

Bard (6) has reported that the lower the price, the higher the number of pupils who buy the school lunch. In two schools, where the price was twenty cents, the participation was 100 percent. In a third school, it was 75 percent. In three schools where the price was twenty-five cents the participation was 95, 76, and 68 percent. In five schools, participation dropped sharply to 27, 37, 38, 48, and 52 percent when the price was increased to thirty cents. When the price went to over thirty cents, there was not a great difference in participation, with an average of 33 percent.

Participation rates for the 300 schools studied by Murphy and Grossman (56) ranged from 10.3 percent to 100 percent with an average of 63 percent. Schools with low participation rates were mostly located in large cities where it was possible that many children go home for lunch. The high-rate schools, in contrast, were mostly located in small communities where a great number of students came to school by bus.

Callahan (42) reported that 300,000 Massachusetts children in October 1969 still attended schools without lunch facilities. Nearly 250,000 children who had the opportunity to participate in the lunch program chose not to, and 125,000 who bought the type A meal did not eat an adequate lunch because of plate waste. In schools from low income areas, the type A lunch was available in all secondary schools of the survey; in 84 percent of the junior high schools and in 53 percent of the elementary schools.

Doucette (62) in 1971 said that most Hawaii high school students felt that school lunch was a bargain at 25 cents, well below the average national level. In some ways, however, it was thought that the low-priced lunch worked as a disadvantage. A majority of students, 69 percent stated that if the school had an open campus policy, they would eat the school lunch less often. There was a possibility that a reverse psychology was at work here: "if the price is cheap, maybe the merchandise is cheap." Comparison of the lunch rating and participation by students brought these results: The school with the highest overall student rating of the lunches had the lowest average participation rate of 44 percent. Schools with the lowest student ratings of the lunches had highest participation rates of 71 and 62 percent. Often high participation rates seem to equate favorable student attitudes, but the researchers suggested here that while a closed campus policy may result in increased participation, it may also cause negative attitudes. On the other hand, they felt that an open campus policy might bring about favorable attitudes and a long-range increase in participation. The state wide average showed that over 80 percent of students in attendance were participating in the program.

Law et al. (49) found that 70 percent of the teenagers he interviewed ate the school lunch. This large number was attributed to closed campuses at 13 of the 16 schools observed. More of the students who had a choice of menus ate at school than those who did not. Girls eating the school lunch out-numbered boys. Meal prices in schools offering a choice of menu ranged from 20 to 40 cents, with the average being 29 cents. In the schools that offered only one menu, the price ranged from 15 to 30 cents, with an average of 25 cents. In this study, participation was not affected by lunch prices as determined from a questionnaire administered to the parents. This study showed that fast service and good food were important to the tenth-grade students. Thus, the key to increasing participation by teenagers in the school lunch would seem to be the school food service manager. As noted by Leverton, (40) participation is relatively high in programs managed by those who are alert to teenagers needs and preferences.

According to the "Lunch Bunch" study by Emmons et al., (44) when elementary school children were tested in the fall, 69 percent in District A ate school lunches and 31 percent brought bag lunches. In District B, 42 percent of the children ate school lunches and 58 percent brought bag lunches. The higher cost of lunches in District B, i.e., 40 cents compared with 25 cents in District A, appeared to affect participation. During the experimental period that followed fall testing, children received the school feeding programs free. Throughout that period, they took an average of 94 percent of the school lunches offered in both districts and, in District B, an average of 80 percent of the breakfasts offered. To be included in the test sample, children had to have taken 70 percent or more of the breakfasts and/or lunches offered during the experimental period. In District A, 98 percent of the children, while in District B, only 70 percent of the children met this requirement.

Acceptability of Food Served in Schools

In order for the school children to benefit from the school lunch program, they must like and eat the food served in the Type A lunches. Serving well liked foods that students will eat is obviously the desire of most food service personnel. Opponents of school lunch, participants, and parents often point to the waste which accrues as a result of students' refusal to eat certain items. Such groups are often vocal about the amount of food discarded in the garbage can (65).

The procedure of weighing or measuring plate waste to determine acceptability of school lunches has been used in several studies (46, 48, 66, 67, 68). More recently, amounts of nutrients consumed based on analyzed values have been reported by Head and Weeks (65).

In 1950, Augustine et al. (48) were the first to report on the acceptability of school lunches. They found that 80 percent or more of the students accepted meat, fish, poultry, sandwiches (except peanut butter), meat substitutes, desserts, and milk. Vegetables and salads were usually accepted by 75 percent of the students. To serve adequate lunches at a minimum cost, careful planning was needed to include low cost foods of high nutritive values. Dreisbach and Handy (69) found that food preferences differed from school to school.

Mirone and Harvey (70) reported that plate waste was reduced among first and second grade children when the quantity of food was adjusted to the age of the child, but the waste was excessive for grades 3 to 7.

In a later study, Augustine and Hunter (71), also found that by adjusting portion sizes to meet the needs of different age groups, the cost of lunches for younger children was decreased while the cost of lunches for older children was higher.

Carver and Patton,(66) Patton et al.,(67) and Hunt et al.(68) conducted a longitutional series of studies on plate waste, of 200 Ohio children in grade 1 to 8, as a measure of food acceptance in the school lunchroom. The first part of the report considered the food habits of school children and the over-all plate waste. Carver and Patton (66) concluded that children in the first grade had more plate waste at the beginning of the school year than they did later in the year, and that they contributed the highest percentage of food returned. Grades 1 to 3 ate proportionately less than did the older children. Milk was well liked by all children.

In the second part of the research, the waste of individual foods was considered. Vegetables contributed the greatest amount of waste, and first, second, and sixth graders were responsible for more than half of the food returned. Meats served plain rather than in a mixture were preferred by the children. Canned vegetables were preferred to frozen products and green beans were the most popular vegetable. More plate waste occured when "swapping" of food among the children was not permitted (67).

An educational program was designed to reduce plate waste and to increase the acceptance of vegetables by the children. It was found that children ate more of the vegetables with which they were most familiar and had been served regularly at home. When new vegetables were introduced at tasting parties and subsequently in the school lunch, the acceptance was variable but tended to improve with familiarity. During a resurvey the following year, the improved acceptance of familiar and unfamiliar vegetables had been maintained.(68).

Augustine et al. (48) found that milk was well accepted by elementary school children. This was confirmed by Myers et al. (72). Due to large intakes, they found that milk and milk products contributed more nutrients than any other food. Leverton and Coggs (73) reported that children with an average age of 13.5 years, listed milk as one of the foods they were "most willing to eat."

Litman et al. (74) studied the opinions on food, of 1,039 Minnesota children, ten to twenty years old, who liked milk, potatoes, bread, meat, butter, and eggs as everyday foods. Green and yellow vegetables and liver seemed to pose a real problem because of the low esteem children had for these nutritious foods.

Doucette (62) quoted Maretzki and Chung as having categorized the amount of school lunch eaten as "all eaten," "part eaten," and "none eaten." They reported that fruits and vegetables were consumed in the lowest proportions by all age-groups. Girls ate less of the starchy foods than of any other food groups. These data, coupled with the inadequate levels of iron and thiamin calculated as served, gave the authors reasons for concern. On the other hand, with a statewide average of over 80 percent of students in attendance participating in the program, Type A lunch was available to all students in public schools of Hawaii.

Lewis and Bachemin (8) found that tenth-grade students in Louisiana consumed approximately 82 percent of the energy and 84 percent of the protein served. Energy, vitamin A, vitamin B_6, and vitamin B_{12}, iron, and magnesium were consumed in amounts less than one-third of the RDA.

Law et al. (49) compiled questionnaires from 464 tenth-grade students from 16 high schools in Louisiana. They reported: "Some food was listed as being left on the plate by 64 percent of the students in schools which offered a menu choice and by 61 percent of students in schools with only one menu. More girls than boys said they left food on their plates. Vegetables and salads were the types of food left most often. Students especially disliked vegetables whether served at school or at home."

Head and Weeks (65) determined by laboratory analyses the nutritive intake of students eating a Type A lunch. With a few exceptions, students consumed 80 to 90 percent of the various nutrients which were served; 62 to 66 percent of the vitamin A value served was consumed; fifth-grade students consumed only 77 percent of the iron served; and the two younger groups consumed only 69 percent of the ascorbic acid served.

Godfrey and Schutz (75) conducted a study on the acceptance, measured by an attitude questionnaire and by consumption, of low-fat milk by school children. There was no difference in consumption between low-fat and whole milk in elementary schools and senior and junior high schools. They suggested the use of low fat milk in school lunches as being acceptable to students and in conformity with trends toward increased consumption of dairy products with a low-fat content.

Future Meal Planning - Nutrient Standards

The U. S. Department of Agriculture sponsored research to determine the feasibility of planning school lunches to meet a nutrient standard. The idea behind the study was if the total calculated value of the lunches can meet specific nutritional goals, a pattern of serving may not be essential. Two studies (13, 65) reported on the analyzed and calculated values of meals as served and also on the amounts of nutrients consumed by the children. All meals were inadequate in calories, and a high proportion were low in ascorbic acid and iron. The need for greater standardization of procedures and adherence to standardized recipes was indicated. Correction factors for use in planning menus according to calculated levels of nutrients were suggested.

The reports of the death of the Basic Four Food Groups, as the foundation for a daily food guide, are greatly exaggerated according to Leverton (76). After careful reviews, USDA has decided to retain, for the time being, the Basic Four as one of its tools for teaching the principles of food selection for good nutrition.

On the other hand, the Rutger's study (77), a joint effort of USDA, the Office of Economic Opportunity and the State of New Jersey, found that menus planned around a nutrient standard, including engineered foods, could be highly acceptable to students if planned around foods they enjoy. For children bringing their lunch from home, there was a vitamin supplement in the form of a packaged dessert sold in the lunchroom to improve micronutrient intake levels. To optimize milk acceptance, chocolate and other flavored milks were allowed. Lachance et al. (77) who conducted the Rutger's Study, maintained that "engineered", particularly "nutrified" foods could mean a better and balanced diet in spite of changing food habits. The "two item breakfast/supplemental feeding" approach defined as a beverage and a solid food combination was successful in assuring one-fourth of the RDA for all nutrients except energy. Schools which do not provide lunch or breakfast but participate in the special milk program could easily assure the nutritional equivalence of breakfast or a supplemental feeding in the mid-afternoon. Its acceptance was high, as it contained finger food easy to serve and eat.

Although, it has now been reconsidered, in 1973 the Food and Drug Administration, had proposed that wheat flour and bread be enriched with iron to 25 mg./lb. of bread and to 40 mg./lb. of flour, in view of the evidence of widespread iron deficiency, especially in infants and children of this country (78).

The concept of menu planning based on meeting specific nutrient requirements has been studied by Harper and Jansen (79, 80). Frey et al. (81), Harper et al. (82), and Jansen et al. (83) have presented a three-part comparison of types and nutrient standards for school lunches. In the first part, methodology was developed for planning school lunch menus which meet a specific nutrient standard. The method considered nine-indicator nutrients plus calories and percentage of calories coming from fat. The nutrient composition of approximately 625 school lunch menu items were calculated using USDA Handbook No. 8 (84). All nutrient data were converted to bead units which were summed on an abacus until the meal requirements were met. Testing of the method showed it was usable by school lunch menu planners and provided menus meeting certain minimal nutrient constraints (81). In the second part of the study, Harper et al. (82) found no significant differences between Type A and Nutrient Standard Menu (NSM) planning methods in average daily participation, food costs priced with and without USDA-donated foods, and labor costs. Menu planners of varying education and experience levels successfully planned accurate NSM menus and endorsed the method as an exciting and viable alternative to the Type A pattern. Sixty preferred NSM due to its nutrient assurance, flexibility, and potential for nutrition education.

In the last part of their report, the calculated nutritional value of school lunches for fifth and tenth-grade students planned according to the Type A lunch pattern and a nutrient standard menu were compared on the basis of meals as planned, served, and eaten. On an "as eaten" basis, menus planned by both methods were low in calories, iron, and thiamin. Although the differences were small, the NSM menus were consistently higher in nutrients, including calories, iron, and thiamin, and lower in percentage of calories coming from fat. The number of schools where the lunches, on the average, furnished less than 60 percent of the standard for calories, iron, and thiamin was significantly less for NSM menus than for Type A. An important reason for the higher level of nutrients in NSM menus was that a higher ratio of food planned was actually served. In addition, in the case of iron, a higher nutrient-calorie ratio was observed. Food ratings, as determined in the classroom before the meal, correlated with food consumption as determined by plate waste analyses. Milk beverages had the highest ratings and consumption, followed by starches, baked goods, sandwiches, and entrees. Salads and vegetables were rated low and consumed least (83).

As a conclusion, Nutrient Standard Menus offered the following advantages:

1. Assurance that menus provide needed nutrients.
2. Increase in menu planning flexibility.
3. Improvement in the acceptability of menu item selection.
4. Decrease in food wastage.
5. Increased accountability of the nutrients in fortified foods.
6. Improvement in menus required for special dietary problems.
7. Reduction in cost.

CHILD NUTRITION ACT

The Child Nutrition Act of 1966 extended the National School Lunch Act to give assistance to the schools for the Special Milk Program, the Breakfast Program, and the Non-Food Assistance Program now called the Food Service Equipment Assistance (85). It provided a small appropriation for nutrition education.

Special Milk Program

The Special Milk Program attempts to teach good milk drinking habits to children, and contribute to their well being. This program reimburses schools, childcare centers, settlement houses, and summer camps for part or all of the cost of milk served. This has helped to cut down on milk surpluses and reduced the cost of milk to the children.

Breakfast Program

The Breakfast Program authorized on a limited basis in 1966, was made available in 1973 to all schools desiring it. This program first aimed at schools with a generally low-income population and at schools to which children from low-income facilities were bussed. In 1974, the Federal contributions in cash and donated foods totaled 61.9 million dollars and the program reached 1.6 million children. More than 8 percent of the 224.5 million breakfasts served were provided free or at reduced-price to needy children (63).

O'Connell (86) studied a group of 200 children in Rhode Island. She concluded that when breakfast, the meal most often skipped by adults and children, was provided there was an improvement in the grade point averages and the daily attendance reports of the students receiving breakfast. She also noted a decrease in the number of detention reports from these same students. Thus, there were contributions to the social and academic performance of the students.

Food Service Equipment Assistance Program

The Food Service Equipment Assistance Program helps State Education Agencies to finance food service equipment to enable schools in low-income areas to establish, maintain, and expand food services. Federal funds are apportioned on an equitable basis among the States, to pay for up to three-fourths of the total price of the equipment and installation charges. The remaining one-fourth must come from sources within the State. A total of 24 million dollars was provided to assist 8,092 schools during the year 1974.

NUTRITION EDUCATION

Besides furnishing nutrients, the school lunch program is designed to improve food habits. Many states and school systems accomplish health education by supplementing the child's exposure to the variety of foods served in the lunchroom with lectures in science and health classes on the value of good nutrition. With the passage of the Child Nutrition Act of 1970, a small amount of the appropriation was provided for the first time for nutrition education, the training of school lunch personnel, and studies on school lunch needs. In the fall of 1975, Public Law 94-105 was passed. The secretary of Agriculture was required to utilize one million dollars annually, to teach school children the nutritional value of foods, and the relationship of nutrition to human health. Finally, Public Law 95-1966 was passed on November 10, 1977. It is the most dramatic and far-reaching amendment on nutrition, education, and training, which states that: "Congress find that the proper nutrition of the nation's children is a matter of highest priority." Its purpose is to "encourage effective dissemination of scientifically valid nutrition information." Accordingly, nutrition education programs should include:

1. Instructing students about the nutritional value of food and the relationship between food and human health.

2. Training school food service personnel in the principles and practices of food service management.

3. Instructing teachers in sound nutrition education principles.

4. Developing and using classroom materials and curricula.

Thus, state departments of education could receive a portion of the administrative funds in the form of cash grants from the U. S. Department of Agriculture, to hire a nutrition education coordinator who will develop a state plan to carry out the objectives of the legislation. Funding will be at the rate of 50 cents for each child enrolled in schools or institutions within the state, with no state receiving less than $75,000 per year. For the first two fiscal years, funding will be on an entitlement basis. After that, the funds will be appropriated by Congress annually.

III. REASEARCH PROCEDURE

This investigation dealt with the following five aspects:

1. An assessment of the nutritive value of Cold and Hot Type A School Lunches as served.
2. An assessment of the nutritive intake of the children who consumed either the Cold or Hot Type A School Lunches.
3. A comparison of the nutrient intake from lunches brought from home or eaten at home and the Type A School Lunches served.
4. A comparison of the acceptability of Cold and Hot Type A School Lunches in terms of participation and plate waste.
5. A comparison of the nutrient intake obtained from free, reduced-price, and paid-in-full lunches.

Selection of Participants

Central Falls, in the spring of 1974, presented an ideal situation for investigating different types of school lunches. The Cold School Lunch served in public schools since the spring of 1972 was being phased out. Hot lunches were scheduled to be served starting with the new school year in the fall 1974. Parochial schools had no School Lunch Program.

Central Falls, Rhode Island, is a community of dense, rather stable population, where many immigrants from Canada and more recently from Portugal and Latin America have settled. As low socio-economic conditions are prevalent, a large number of reduced-price and free lunches were served.

All six schools in Central Falls having a sixth-grade were studied. Sixth-grade school children were chosen, because the kinds and amounts of foods in the Type A School Lunch pattern are based on the nutritional needs of 9 to 12-year-old children.

Before the experimental study was begun, arrangements were made with school principals for permission to conduct this investigation. The investigator also observed the lunch period at every school. Faculty, State School Lunch Aides, and students were aware of the purpose of this study. One-week data collection periods were conducted in two phases: Phase I, in the Spring of 1974; Phase II, in the Fall of 1974 and the Winter of 1975.

PHASE I--SPRING 1974

The first phase of the program involved 310 students, 163 boys and 147 girls, attending six schools. Three were public schools and served a Cold School Lunch. The three others were non-public schools and had no School Lunch Program. Many children went home to eat. The others ate at school a lunch which was brought from home.

In the public schools, as part of the State-sponsored School Lunch Program, the lunches served were prepared at the School for the Deaf, Corless Park, North Providence, and were distributed by truck to the three schools. The lunches, although cold, met the requirements of the Type A pattern and qualified for Federal reimbursement. See Appendix A for Menu Schedule during the week of investigation.

The study did not disturb the noon meal routine. As usual, students could get milk only or a complete cold bag lunch. The children who chose the lunch obtained a half-pint carton of pasteurized whole milk and a brown bag containing either a sandwich or pizza, a fruit, one cookie, a napkin and a straw. No seconds were available, and portions were standardized except for the fruits. Two State School Lunch Aides distributed the lunches that were free, reduced-price (twenty cents), or paid-in-full (forty cents). Milk was either free or sold for five cents. No discrimination regarding payment or identification of the students was noted during the study. See Appendix B for Family Size Income Scale for free and reduced-price lunches.

As the menu was kept simple, only a table in the corridor for milk containers and the cardboard boxes containing the brown bags was needed for distributing the lunches. Two schools had one center of distribution; the other school had two centers of distribution--one on each floor. Students moved very rapidly along the line, as there were no choices, and everything was ready to pick up and easy to carry. The boys and girls went back to their classrooms where they ate. The investigator noted that there was frequent exchange of food during lunch time. Even pupils bringing food from home traded between themselves and with the children eating the school lunches. Schuchat (87) had also observed the same situation.

After the children had finished eating, they were asked to write their name on their brown bags, whether or not there were any leftovers. They disposed of them in large plastic bags as usual. Milk containers with any leftover milk were sealed with masking tape and labeled with the child's name. All bags from school lunches were collected and most from home lunches. A few students kept the leftovers because their mothers wanted them back. All food waste was weighed outside the schools, as the classrooms could not be used. One sample cold lunch was weighed as representing the lunch as served. Each food item was weighed separately. Sandwiches were separated into their components. Hanson diet scales, 1,000 grams capacity, with the dial scaled at 2 grams, were used to weigh the waste. Measuring cups were used to measure amounts of the leftover milk. Amounts of food consumed were calculated by subtracting the leftover weight from that of the average serving.

Before the lunch period on the first day of the investigation, students from all six schools were instructed on how to complete a Dietary Record, giving a description of and the amount of food eaten at their noon meal. They were given oral instructions plus a copy of the Instruction Sheets for handy referral. See Appendix C for samples of Dietary Record and Instruction Sheets.

Each day, the supervisors and teachers distributed and collected the Dietary Record Sheets. In the public schools, the investigator circulated from one classroom to another every day. Whereas in the non-public schools, the teachers supervised the keeping of the Dietary Records. The children were asked if vitamin supplements were taken. The teachers were shown how to make a quick check on the records, when the children returned their completed dietary record sheets. The lunch period supervisors had also consented to help students who were unable to fill out their records because of language difficulty or inability to identify food items. Students who did not eat at school were identified and completed the dietary records when they came back to their classrooms.

PHASE II - FALL 1974 AND WINTER 1975

When school re-opened in the fall 1974, one public school had closed its doors. The closing of the school did not affect the results of the study. Sixth-grade students had been re-assigned to the two remaining schools.

By November, the investigator observed the new Hot Lunch Program in one of the schools and judged that it was established well enough to be investigated. Delay in starting the Hot Lunch Program in the other school, postponed the study in the second public school until February 1975. The Holiday Season was considered an inappropriate time for this study.

Food for the Hot Lunch Program was prepared at the Central Falls Junior and Senior High School. It was distributed by trucks in insulated containers. The containers were electrically heated before delivery and plugged in again upon arrival at the schools. Hot tables stationed in the corridors kept food warm during the serving period, except in the gym of the second school where food was served from a regular table.

In school 1, the basement was modified to serve as a cafeteria where the students ate their lunches. All sixth-grade students ate during the same lunch period and sat together by class. This was helpful to the investigator who attended all serving periods. Plastic compartmented trays were used. The students picked their utensils, napkin, tray, and milk container and straw. They moved quickly along the line.

In school 2, the students ate in their classrooms and in the gym used as an open classroom. The schedule was such that even if meals were eaten in different rooms, the investigator could be present during all the serving and eating periods. In this school, they used disposable cardboard trays.

Portion sizes were frequently checked during all periods of the service in both schools. Time permitted that only one sample a day was weighed, but this was considered representative of the average meal served to the sixth-graders. The State School Lunch Aides serving the meals had experience and had been instructed to use measuring devices such as calibrated scoops, ladles, spoons, or a certain number of pieces of food or cuts per pan. They followed the charts for portion sizes given in Appendix D.

One student was trained to keep a list of the children receiving seconds or thirds of each food item when offered. Records were kept closely, because there was frequent trading of food in the cafeteria. All dietary records were double checked against the trays for each student as they left the room. Students were asked if they gave any food from their tray or received anything from their friends.

Trays with leftovers were labeled and set aside. A few students were trained to weigh the plate wastes. The investigator verified and recorded the results herself. Each food item left was scraped with a rubber spatula from the tray and weighed separately on Hanson diet scales. Leftover milk was measured in a measuring cup rather than weighed for practical reasons. Food consumed was calculated by subtracting the leftover from the representative serving.

The dietary records of the Hot and Cold School Lunches, lunches brought-from-home, and those eaten-at-home were evaluated for energy, protein, fat, carbohydrates, fiber, calcium, phosphorous, iron, sodium, potassium, vitamin A, thiamin, riboflavin, niacin, ascorbic acid, saturated fatty acid, unsaturated oleic acid, unsaturated linoleic acid, and cholesterol; and percent RDA (88) by a computer program based on USDA Handbook No. 8 (84).

The t test was used to determine the significant difference of nutrient intake as follows:

1. Hot vs. Cold School Lunches.
2. Eaten-at-home vs. Hot or Cold School Lunches.

3. Brought-from-home vs. Hot or Cold School Lunches.

4. Males vs. females.

5. Public vs. non-public school children.

IV. RESULTS AND DISCUSSION OF RESULTS

Frequency of Meals

This study included the nutritional evaluation of a total of 1,965 meals consumed by 495 sixth-grade students (266 boys and 229 girls) attending Central Falls Schools. Table I shows the distribution of meals between the two sexes.

TABLE 1

TOTAL NUMBER OF MEALS EVALUATED ACCORDING TO SEX

Sex	Number	Percent
Male	1077	55
Female	888	45
	1965	100

This represents 79 percent of the possible 2,475 meals consumed by all participants. Everyday, some children were absent from school, and no records of their lunches could be included. A few students from two public schools were resistant, for the first couple of days, to fill out their dietary records properly. A few students went without lunch. Table 2 shows the distribution of meals between the public and non-public schools. For individual schools, refer to Appendix E.

TABLE 2

DISTRIBUTION OF MEALS BETWEEN PUBLIC AND NON-PUBLIC SCHOOLS

Type of Schools	No. of Males	No. of Females	Total No. of Meals
Public	206	167	1398
Non-Public	60	62	567
Total	266	229	1965

Six types of lunches were investigated during the study. Table 3 shows the frequency of the six types of lunches that were consumed. As noted, only one meal was reported from a restaurant. This does not seem realistic because students were regularly seen at neighborhood short order restaurants during the lunch hour. Some of the students that did not fill in their records might have gone to the restaurant. Maybe the awareness of the survey being done, kept them from eating at the restaurant, or perhaps they liked the menus served during the weeks of the study.

TABLE 3

FREQUENCY OF THE SIX TYPES OF LUNCHES

Types of Lunches	Number	Percent
Hot School Lunch	645	32.8
Brought-From Home	576	29.3
Eaten-At-Home	395	20.1
Cold School Lunch	319	16.2
No Lunch	29	1.5
Restaurant	1	0.1
Total	1965	100.0

Only two students were identified by the school authorities, as never eating any lunch. Others skipped lunch on certain days, because they were not feeling well, and others did not eat without stating any reason. School lunches were either paid-in-full by the students, free, or reduced-price. No school lunches were available in the non-public schools. Some children would have been eligible for free and reduced-price lunches had there been a Food Program in these schools. Table 4 shows the frequency of meals according to source of payment. It was the opinion of the school administration that more children could have qualified for free or reduced-price lunches, but the parents never completed the application. No discrimination was found regardless of the source of payment.

TABLE 4

FREQUENCY OF MEALS ACCORDING TO SOURCE OF PAYMENT

Source of Payment	Number	Percent
Free	678	34.5
No School Lunch Available[1]	567	28.9
Did Not Buy[2]	301	15.3
Paid-In-Full	185	9.4
Free Did Not Take	117	6.0
Reduced-Price	101	5.1
Reduced Did Not Take	16	0.8
Total	1965	100.0

[1] Non-public schools.

[2] Public school students who could have paid-in-full and obtained a school lunch.

Participation In National School Lunch Program

Participation in the School Lunch Program increased markedly when hot lunches were started in Central Falls. From 804 Cold School Lunches served in 1973 to 1974, it increased to 1,483 Hot School Lunches in 1975 to 1976. This trend was attributed to the newness of the hot meals, but as Appendix F shows, the rate of participation was maintained over a period of time. Difficult economic situations could have been responsible for the increase in free and reduced-price lunches served, but school personnel affirmed that hot lunches were preferred to cold meals.

In 1977, the national participation rate in the School Lunch Program was 57.3 percent of the total enrollment as compared to 56.0 percent in 1974. In Rhode Island, participation in the School Lunch Program was 46.9 percent in 1977, as compared to 40.8 percent in 1974. During this study, an average of 39.4 percent of the sixth-grade students participated in the Cold School Lunch, while 63.9 percent participated in the Hot School Lunch Program.

Nutritional Content of Hot and Cold School Lunches

None of the hot or cold school lunches, as served, met the goal of one-third of the RDA (88) of all nutrients for boys and girls, 11 to 14 years old, as seen in Tables 5 and 6. Therefore, the level of one-fourth of the RDA (88) was considered appropriate for discussion. When one-fourth of the RDA (88) for girls is considered, school lunches contained at least 25 percent of the RDA (88) except for vitamin A and niacin in cold meals, and iron in all meals. When one-fourth of the RDA (88) for boys is considered, hot lunches served at school 1 contained 25 percent of the RDA (88) for all nutrients except iron. The hot meals in school 2,

TABLE 5

AVERAGE NUTRIENT CONTENT AND PERCENT RDA OF HOT SCHOOL LUNCHES SERVED IN TWO PUBLIC SCHOOLS IN CENTRAL FALLS, R. I.

Energy And Nutrients	School 1			School 2		
	Mean Content	Males RDA %	Females RDA %	Mean Content	Males RDA %	Females RDA %
Food Energy, kcal.	759 ± 112[1]	27	31	665 ± 49[1]	23	27
Protein, gm.	27.5 ± 5.3	62	62	28.7 ± 5.6	65	65
Fat, gm.	39.4 ±10.0	--	--	32.8 ± 3.9	--	--
Carbohydrates, gm.	75.0 ±14.2	--	--	65.1 ± 7.4	--	--
Fiber, gm.	1.6 ± 0.6	--	--	1.4 ± 0.6	--	--
Calcium, mg.	371 ± 34	30	30	368 ± 22	30	30
Phosphorous, mg.	481 ± 100	40	40	475 ± 78	39	39
Iron, mg.	4.2 ± 0.8	23	23	3.4 ± 1.1	18	18
Sodium, mg.	1429 ± 659	--	--	871 ± 308	--	--
Potassium, mg.	1054 ± 166	--	--	1003 ± 106	--	--
Vitamin A, IU	3570 ±4915	71	89	2414 ±3321	48	48
Thiamin, mg.	0.50 ±0.14	36	42	0.41 ±0.23	29	34
Riboflavin, mg.	0.74 ±0.09	49	57	0.66 ±0.06	43	50
Niacin, mg.	4.9 ± 1.2	27	30	4.6 ± 1.3	25	29
Ascorbic Acid, mg.	17.7 ±10.2	39	39	18.7 ± 7.2	41	41
Sat. Fatty Acid, gm.	14.8 ± 2.9	--	--	12.2 ± 2.1	--	--
Unsat. Oleic Acid, gm.	14.3 ± 3.9	--	--	11.2 ± 2.2	--	--
Unsat. Linoleic Acid, gm.	6.1 ± 4.1	--	--	4.7 ± 1.9	--	--
Cholesterol, mg.	95.2 ±22.6	--	--	91.8 ±16.4	--	--

[1] Standard deviation.

TABLE 6

AVERAGE NUTRIENT CONTENT AND PERCENT RDA OF COLD SCHOOL LUNCHES SERVED IN THREE PUBLIC SCHOOLS IN CENTRAL FALLS, R. I.

Energy And Nutrients	Mean Content	Males RDA %	Females RDA %
Food Energy, kcal.	616 ± 54[1]	21	25
Protein, gm.	21.9 ± 3.7	49	49
Fat, gm.	24.8 ± 4.4	--	--
Carbohydrates, gm.	78.9 ± 6.9	--	--
Fiber, gm.	1.4 ± 0.6	--	--
Calcium, mg.	426 ± 92	35	35
Phosphorous, mg.	429 ± 72	35	35
Iron, mg.	2.8 ± 0.9	15	15
Sodium, mg.	931 ± 251	--	--
Potassium, mg.	850 ± 174	--	--
Vitamin A, IU	767 ± 214	15	19
Thiamin, mg.	0.39 ±0.15	27	32
Riboflavin, mg.	0.67 ±0.08	44	51
Niacin, mg.	3.4 ± 1.3	19	21
Ascorbic Acid, mg.	43.7 ±41.5	97	97
Sat. Fatty Acid, gm.	9.8 ± 2.2	--	--
Unsat. Oleic Acid, gm.	9.6 ± 2.1	--	--
Unsat. Linoleic Acid, gm.	1.3 ± 1.0	--	--
Cholesterol, mg.	70.3 ±21.2	--	--

[1]Standard deviation.

contained only 23 percent of the RDA (88) for energy and 18 percent for iron. Cold lunches failed to meet 25 percent of the RDA (88) for energy, iron, niacin, and vitamin A.

Hot lunches contained an average of 712 kcal. as compared to 616 kcal. for the cold lunches. The two hot menus, showed a great variation in energy value--as much as 94 kcal. Murphy and Grossman (55) in a nationwide survey have reported 735 kcal. as the average energy value of school lunches. In this study, only the hot meals in school 1 compared to Murphy and Grossman's values.

The goal for protein was surpassed in all the hot and cold lunches. This is in accord with earlier studies by Murphy and Grossman (55) and Martin (46). Cold lunches contained 49 percent of the RDA (88) for proteins, compared to 62 percent and 65 percent of the RDA (88) for hot lunches. The goal of one-third of the RDA (88) was met because of the proteins supplied by milk and the two ounces of meat, fish, or cheese. Murphy and Grossman (55) reported a mean value of 29.8 gms. of proteins from the nationwide study which was also about 150 percent the nutritional goal of one-third of the RDA (88).

According to these results, the two ounces of meat or meat substitute could be reduced in order to bring the protein value closer to the allowances. However, this would bring the percentage of calories from protein below the suggested level. Actually, 15 percent of the calories came from protein in the cold lunches, and 17 percent of the calories were from protein sources in the hot lunches. These percentages are considered desirable for adolescents and children, and the protein intake should probably remain unchanged. Consideration must also be given to the relationship among protein, thiamin, niacin, and riboflavin found by

Eppright et al. (30) and Murphy et al. (56). Any reduction in protein, although a possible way of saving money because the meat item is the most costly one, would affect the vitamin B content of the meals. Furthermore, the mineral content of the lunches, especially iron, would be lowered if protein were limited. Another factor is the high acceptability of meat and meat substitutes by the children. If this item was to be reduced, the meal might be less attractive to the students.

In cold lunches, 35 percent of the calories came from fat; 46 percent, from fat in the hot lunches served at school 1, and 43 percent at school 2. Obviously, the percentage of fat was kept to a more desirable level in cold lunches than in hot lunches. High levels of fat in the diet, especially saturated fatty acids, have been related to artherosclerosis and heart disease. The cholesterol content of the hot lunches was higher than that of the cold lunches.

Hot lunches contained 30 percent of the RDA (88) for calcium, and cold lunches met the goal for calcium, supplying 35 percent of the RDA (88), because cheese was included in cold menus twice during the week. The phosphorous content of all lunches met the nutritional goal of 400 mg.

Iron in the American diet is a well-known dietary problem. Hot lunches met 18 and 23 percent of the RDA (88), while cold lunches contained 15 percent of the RDA (88). The use of liver and more green vegetables could help solve the problem, but this is not a practical solution because these items are not popular with youngsters. Murphy and Grossman (55) have reported an average of 4.2 mg. of iron in School Lunches. In school 1, the hot lunches contained 4.1 mg. of iron and in school 2, 3.4 mg. of iron. The lowest contribution was the cold lunch with 2.7 mg.

Hot lunches met, 48 and 71 percent of the RDA (88) for vitamin A for the boys and 60 and 89 percent of the RDA (88) for girls in schools 1 and 2 respectively. Milk, margarine, and a good selection of green leafy and yellow vegetables assured a safe supply of this vitamin. However, it should be noted that the average vitamin A content of the hot lunches in school 2 was considerably lower than in school 1. School 1 had fruits for dessert more often than school 2 together with vegetables of higher vitamin A content. Cold lunches fell short of the goal, with 767 I. U. or 15 percent of the RDA (88) for the boys and 19 percent of the RDA (88) for girls. No vegetables which were good sources of vitamin A were included in the cold menus, except for tomato and lettuce in the sandwiches.

At least one-fourth of the RDA (88) for thiamin was supplied to both sexes by hot and cold lunches. The relationship of calories to thiamin was observed as in previous studies. Had the caloric content been raised to the goal of one-third of the RDA (88), the thiamin level would have most likely followed.

Riboflavin in hot and cold lunches supplied over 43 percent of the RDA (88). Milk safeguards this vitamin as earlier noted by Murphy and Grossman (55), and Martin (46).

The niacin content of 3.4 mg. in cold lunches which represented 19 percent of the RDA (88) for boys and 21 percent of the RDA (88) for girls was found to be low. This was not considered a problem as good quality animal protein was available. Hot lunches contained 4.8 and 4.6 mg. of niacin, contributing at least one-fourth of the RDA (88); this was 27 and 25 percent of the RDA (88) for boys and 30 and 29 percent of the RDA (88) for girls.

Ascorbic acid met the goal of one-third of the RDA (88) for all lunches. Cold lunches included fresh citrus fruits and contained 97 percent of the RDA (88) as compared to 40 percent in hot lunches.

No dietary allowances have been established for sodium and potassium, but the values observed in this study (1429 and 871 mg.) indicate a wide variation in sodium content of hot lunches. The potassium content of the hot lunches (1054 and 1003 mg.) did not vary as much. The sodium and potassium contents of the Cold School Lunches were lower than those of the Hot School Lunch.

Nutrient Losses From Plate Waste

Table 7 shows that there was a higher percentage of energy, protein, calcium, thiamin, riboflavin, and ascorbic acid lost from the Cold School Lunch than from the Hot School Lunch. Most of these losses except the ascorbic acid resulted from the sandwich being discarded more often than the hot main dish. Even though there was more ascorbic acid lost with the cold meals, the average contribution of cold meals was almost double that from the hot meals. Fresh citrus fruits were served with cold meals instead of canned fruits used with hot meals. Calcium and riboflavin were also served, as cheese, in greater amount in Cold School Lunches than in Hot School Lunches. So even after waste was considered, the amount of calcium consumed was higher from the Cold School Lunches than from the Hot School Lunches.

Better acceptance of the hot main dish was responsible for a 4 percent waste of protein as compared to 6 percent waste for the Cold Lunch. All lunches, however, met the goal of one-third of the RDA (88) for protein and riboflavin regardless of the plate waste. Vitamin A was the nutrient most wasted. This loss amounted to 36 percent in Hot Lunches

TABLE 7

PERCENT NUTRIENT LOSSES FROM PLATE WASTE FOR COLD AND HOT SCHOOL LUNCHES

Type of Meal	Energy %	Protein %	Calcium %	Iron %	Vitamin A %	Thiamin %	Riboflavin %	Niacin %	Ascorbic Acid %
Cold School Lunches	6	10	15	10	17	17	14	7	29
Hot School Lunches	4	4	7	12	36	12	7	8	20

because green and yellow vegetables were served and, as suspected, were the most rejected item on the menu. It is possible that nutrition education would have helped to develop an acceptance of these important sources of nutrients (52, 68).

Based on the fact that Hot Lunches are more accepted than Cold Lunches, the waste of 4 percent of the energy value of the Hot Lunches was not greatly improved from the six percent lost from the Cold Lunches. Plate waste from both kinds of School Lunches was still considerably lower than reported by other investigators (8, 65).

Nutritional Intake From Lunches

As a group, boys had significantly higher ($p < 0.01$) nutrient intakes than the girls for every nutrient except ascorbic acid which was similar for both sexes. The percentages of the RDA (88) were similar for both sexes because of the higher allowances for boys for certain nutrients, as shown in Table 8. The average intakes of energy, iron, calcium, vitamin A, thiamin, and niacin were below the goal of one-third of the RDA (88) and over 70 percent of the boys and girls failed to meet this goal for these nutrients.

When public and non-public schools were compared, the boys consumed more nutrients than the girls, except for ascorbic acid. This is shown in Tables 9 and 10. The public school boys had significantly higher intakes of vitamin A ($p < 0.05$), thiamin ($p < 0.05$), and ascorbic acid ($p < 0.01$) than the non-public school boys who consumed significantly more energy ($p < 0.05$) and niacin ($p < 0.01$). Appendix G shows the average nutrient intake in individual schools. The public school girls consumed significantly more calcium ($p < 0.01$), and riboflavin ($p < 0.05$) but

TABLE 8

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES AND FEMALES FROM ALL TYPES OF LUNCHES

	Males n=245			Females n=206		
Energy And Nutrients	Mean Intake	RDA %	Below 1/3 RDA %	Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	684 ± 207[1]	23	88	621 ± 194[1,2]	25	81
Protein, gm.	24.4 ± 9.4	54	14	21.2 ± 7.3[2]	47	17
Fat, gm.	31.3 ±12.2	--	--	28.5 ±11.6[2]	--	--
Carbohydrates, gm.	78.1 ±24.7	--	--	72.0 ±24.2	--	--
Fiber, gm.	1.0 ± 0.6	--	--	1.0 ± 0.5	--	--
Calcium, mg.	334 ± 165	27	73	293 ± 140[2]	23	84
Phosphorous, mg.	417 ± 166	34	44	367 ± 135[2]	30	62
Iron, mg.	3.3 ± 1.2	17	96	3.0 ± 1.1[2]	16	98
Sodium, mg.	1088 ± 485	--	--	968 ± 407	--	--
Potassium, mg.	787 ± 310	--	--	718 ± 258	--	--
Vitamin A, IU	1136 ±1275	22	81	992 ±1134[2]	24	82
Thiamin, mg.	0.38 ±0.15	16	75	0.35 ±0.13[3]	28	70
Riboflavin, mg.	0.60 ±0.26	39	31	0.53 ±0.21[2]	40	31
Niacin, mg.	4.4 ± 1.9	23	83	3.9 ± 1.6[2]	23	82
Ascorbic Acid, mg.	20.6 ±20.9	45	51	22.7 ±26.7	49	54
Sat. Fatty Acid, gm.	11.7 ± 5.1	--	--	10.6 ± 4.5	--	--
Unsat. Oleic Acid, gm.	11.6 ± 4.4	--	--	10.5 ± 4.5	--	--
Unsat. Linoleic Acid, gm.	4.1 ± 2.7	--	--	3.9 ± 2.8	--	--
Cholesterol, mg.	92.4 ±77.1	--	--	81.0 ±48.3	--	--

[1] Standard deviation.

[2] Significant difference $p < 0.01$ males vs. females.

[3] Significant difference $p < 0.05$ males vs. females.

TABLE 9

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES IN PUBLIC AND NON-PUBLIC SCHOOLS

Energy And Nutrients	Public Schools n=182 Mean Intake	RDA %	Below 1/3 RDA %	Non-Public Schools n=57 Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	669 ± 198[1]	23	91	737 ± 204[1, 3]	25	80
Protein, gm.	23.9 ± 9.3	53	15	26.1 ± 8.8	58	8
Fat, gm.	31.0 ±12.1	--	--	32.6 ±11.9	--	--
Carbohydrates, gm.	75.5 ±22.4	--	--	86.3 ±26.8	--	--
Fiber, gm.	1.1 ± 0.6	--	--	0.7 ±0.47	--	--
Calcium, mg.	335 ± 143	27	74	336 ± 212	27	71
Phosphorous, mg.	413 ± 155	33	42	434 ± 186	35	46
Iron, mg.	3.2 ± 1.3	17	95	3.5 ± 1.0	19	98
Sodium, mg.	1053 ± 481	--	--	1198 ± 468	--	--
Potassium, mg.	815 ± 297	--	--	728 ± 321	--	--
Vitamin A, IU	1246 ±1407	24	78	869 ± 787[3]	16	86
Thiamin, mg.	0.39 ±0.16	27	71	0.34 ±0.11[3]	24	83
Riboflavin, mg.	0.61 ±0.24	40	28	0.60 ±0.31	39	38
Niacin, mg.	4.2 ± 1.8	22	88	5.1 ± 2.1[2]	27	71
Ascorbic Acid, mg.	22.8 ±20.9	50	45	15.2 ±20.1[2]	33	65
Sat. Fatty Acid, gm.	11.4 ± 4.6	--	--	12.6 ± 6.1	--	--
Unsat. Oleic Acid, gm.	11.4 ± 4.4	--	--	12.1 ± 4.4	--	--
Unsat. Linoleic Acid, gm.	4.3 ± 2.9	--	--	3.9 ± 2.1	--	--
Cholesterol, mg.	87.4 ±82.1	--	--	107.0 ±60.1	--	--

[1]Standard deviation.

[2]Significant difference $p < 0.01$ males vs. females.

[3]Significant difference $p < 0.05$ males vs. females.

TABLE 10

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF FEMALES IN PUBLIC AND NON-PUBLIC SCHOOLS

Energy And Nutrients	Public Schools n=147 Mean Intake	RDA %	Below 1/3 RDA %	Non-Public Schools n=63 Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	610 ± 197[1]	24	83	644 ± 188[1]	26	77
Protein, gm.	21.3 ± 7.2	47	17	21.1 ± 7.4	47	17
Fat, gm.	28.4 ±11.8	--	--	28.7 ±11.2	--	--
Carbohydrates, gm.	69.5 ±24.2	--	--	77.3 ±23.4	--	--
Fiber, gm.	1.1 ± 0.6	--	--	0.8 ± 0.4[2]	--	--
Calcium, mg.	311 ± 129	25	84	257 ± 156[2]	20	85
Phosphorous, mg.	374 ± 126	30	60	351 ± 153[2]	28	66
Iron, mg.	2.9 ± 1.1	15	100	3.4 ± 1.1[2]	18	96
Sodium, mg.	926 ± 444	--	--	1057 ± 301	--	--
Potassium, mg.	735 ± 265	--	--	683 ± 241	--	--
Vitamin A, IU	1063 ±1298	26	82	844 ± 667	20	80
Thiamin, mg.	0.35 ±0.14	28	71	0.35 ±0.13[3]	28	67
Riboflavin, mg.	0.55 ±0.20	41	23	0.49 ±0.24[2]	37	46
Niacin, mg.	3.7 ± 1.6	22	84	4.2 ± 1.6[2]	26	77
Ascorbic Acid, mg.	19.4 ±20.4	42	58	29.5 ±35.5[2]	64	46
Sat. Fatty Acid, gm.	10.4 ± 4.2	--	--	10.8 ± 5.0	--	--
Unsat. Oleic Acid, gm.	10.6 ± 4.7	--	--	10.5 ± 4.2	--	--
Unsat. Linoleic Acid, gm.	3.9 ± 2.8	--	--	3.9 ± 2.6	--	--
Cholesterol, mg.	77.0 ±34.2	--	--	89.2 ±68.4	--	--

[1] Standard deviation.

[2] Significant difference $p < 0.01$ males vs. females.

[3] Significant difference $p < 0.05$ males vs. females.

significantly less iron ($p < 0.01$), niacin ($p < 0.01$), and ascorbic acid ($p < 0.01$) than the non-public school girls.

If the School Lunch Program was discontinued, there would probably be a lowering of the nutritional intake of the public school children. Most likely, the School Lunch Program raised the level of nutrient intake of the public school children to the level of the parochial school children. The school lunches, if they had contained, at least one-third of the RDA (88) as served, might have raised the level of nutritional intake of public school children even more. As there also was room for improvement of the nutrient intake of non-public school children, the availability of a Type A School Lunch providing one-third of the RDA (88) would contribute to the well-being of both non-public and public school students.

Hot and Cold School Lunches

It was impossible for the children participating in the School Lunch Program to have an intake of one-third of the RDA (88) because they simply were not served meals which met that goal for all the nutrients. As shown in Tables 11 and 12, the average nutrient intake from five hot school lunches in two schools, did not meet the goal of one-third of the RDA (88) but met one-fourth of the RDA (88) for boys and girls, for all nutrients except iron. Everyday, the students gave food, with the result that boys consumed more of all nutrients than the girls. Appendix H shows the average nutrient intake from Hot School Lunches in the individual schools. The percentage of the RDA (88) was similar for both sexes because of higher allowances for boys for certain nutrients.

TABLE 11

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES
WHO CONSUMED HOT AND COLD SCHOOL LUNCHES

Energy And Nutrients	Hot School Lunches n=90 Mean Intake	RDA %	Below 1/3 RDA %	Cold School Lunches n=55 Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	716 ± 156[1]	26	91	623 ± 215[1,2]	21	89
Protein, gm.	28.9 ± 7.8	65	3	21.9 ± 7.9[2]	49	16
Fat, gm.	36.4 ± 9.2	--	--	25.4 ± 9.5[2]	--	--
Carbohydrates, gm.	69.8 ±15.6	--	--	79.2 ±28.8	--	--
Fiber, gm.	1.2 ± 0.4	--	--	1.2 ±0.62	--	--
Calcium, mg.	366 ± 103	30	78	394 ± 115	32	52
Phosphorous, mg.	483 ± 119	39	18	413 ± 122	33	47
Iron, mg.	3.5 ± 1.1	18	96	2.8 ± 1.3[2]	15	94
Sodium, mg.	1098 ± 424	--	--	974 ± 505	--	--
Potassium, mg.	1009 ± 232	--	--	760 ± 245	--	--
Vitamin A, IU	2111 ±1642	41	51	677 ± 247[2]	13	100
Thiamin, mg.	0.43 ±0.15	30	59	0.36 ±0.16[2]	25	80
Riboflavin, mg.	0.69 ±0.18	45	8	0.64 ±0.20	42	21
Niacin, mg.	4.6 ± 1.4	25	87	3.6 ± 1.7[2]	19	92
Ascorbic Acid, mg.	16.3 ± 8.4	35	51	30.6 ±22.0[2]	67	34
Sat. Fatty Acid, gm.	13.5 ± 3.5	--	--	9.6 ± 3.6	--	--
Unsat. Oleic Acid, gm.	12.9 ± 3.7	--	--	9.9 ± 4.0	--	--
Unsat. Linoleic Acid, gm.	5.5 ± 2.0	--	--	1.9 ± 1.3	--	--
Cholesterol, mg.	97.8 ±25.0	--	--	71.7 ±32.0	--	--

[1]Standard deviation.

[2]Significant difference $p < 0.01$ males vs. females.

TABLE 12

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF FEMALES
WHO CONSUMED HOT AND COLD SCHOOL LUNCHES

Energy And Nutrients	Hot School Lunches n=65 Mean Intake	RDA %	Below 1/3 RDA %	Cold School Lunches n=44 Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	645 ± 155[1]	26	86	529 ± 165[1,2]	21	93
Protein, gm.	25.2 ± 6.9	56	3	17.5 ± 5.4[2]	39	25
Fat, gm.	33.4 ±10.4	--	--	20.8 ± 7.5[2]	--	--
Carbohydrates, gm.	62.4 ±13.9	--	--	70.4 ±23.8	--	--
Fiber, gm.	1.1 ± 0.5	--	--	1.0 ± 0.6	--	--
Calcium, mg.	323 ± 94	26	92	331 ± 92	27	75
Phosphorous, mg.	421 ± 107	34	35	341 ± 89	27	75
Iron, mg.	3.1 ± 1.0	16	100	2.2 ± 0.9[2]	11	100
Sodium, mg.	998 ± 450	--	--	741 ± 334	--	--
Potassium, mg.	889 ± 222	--	--	674 ± 229	--	--
Vitamin A, IU	1701 ±1621	42	63	592 ± 188[2]	14	100
Thiamin, mg.	0.38 ±0.14	30	66	0.29 ±0.12[2]	23	81
Riboflavin, mg.	0.61 ±0.16	46	9	0.53 ±0.14[2]	40	18
Niacin, mg.	4.1 ± 1.2	25	86	2.8 ± 1.4[2]	17	90
Ascorbic Acid, mg.	12.9 ± 5.5	28	67	31.6 ±27.8[2]	69	40
Sat. Fatty Acid, gm.	12.4 ± 3.6	--	--	7.8 ± 2.6	--	--
Unsat. Oleic Acid, gm.	11.9 ± 4.1	--	--	7.9 ± 3.0	--	--
Unsat. Linoleic Acid, gm.	5.1 ± 2.4	--	--	1.6 ± 1.5	--	--
Cholesterol, mg.	86.8 ±25.1	--	--	57.2 ±19.1	--	--

[1]Standard deviation.

[2]Significant difference $p < 0.01$ males vs. females.

Everyday, the boys also consumed, more of all nutrients, from the cold lunches than the girls did, except for ascorbic acid. The average nutrient intake from five cold school lunches in the three schools fell below the goal of one-third of the RDA (88) and also fell below one-fourth of the RDA (88) for food energy, iron, vitamin A, and niacin for both sexes, and for thiamin for girls (Tables 11, 12 and Appendix I).

Boys consumed an average of 97 kcal. less from the cold menus than from the hot meals. Girls obtained 116 kcal. less from the cold lunches than from the hot lunches. Seventy-eight percent of the children consumed between 21 and 40 percent of the RDA (88) for energy from hot lunches, as compared to 45 percent consuming between 21 and 40 percent of the RDA (88) from cold lunches.

The intake of protein averaged about 16 percent lower for cold lunches than for hot lunches, but met at least one-third of the RDA (88).

The iron intake averaged 17 percent of the RDA (88) for hot lunches as compared to 13 percent for cold lunches. This was in line with the low iron content of the lunches as served.

With the exception of calcium and ascorbic acid, the higher nutrient intake from hot school lunches, was due to the greater amount served. The higher intake of ascorbic acid from cold lunches was due to the serving of fresh fruit in cold lunches. Calcium intake was similar for hot and cold lunches although more calcium was available in the cold lunches. The average intake from the hot lunches was significantly higher ($p < 0.01$) than the cold lunches for calories, protein, fat, iron, vitamin A, thiamin, and niacin for both sexes, and also for riboflavin for the girls.

Free, Reduced-Price, and Paid-In-Full School Lunches

No previous studies have been found which reported on the consumption of meals under different payment options. There was a similarity of nutrient intake from the free and paid-in-full school lunches (Tables 13, 14, 15, 16). When cold lunches were served, the nutritional intake of the students who paid in full, or received free lunches reflected the lower nutrient values served in the cold lunches as compared to the hot lunches. Students receiving reduced-price hot and cold school lunches had a higher nutritional intake than the other two groups.

Entitled to Free or Reduced-Price School Lunches But Did Not Take

When nutrient intake of children who did not take the free lunch that they were entitled to, Table 17, was compared with that of children who received their free school lunches, it was found that the former did not fare as well nutritionally. All nutrient intakes tended to be lower, with vitamin A being drastically as low as 10 percent of the RDA (88) compared to 29 for boys and 31 percent for girls eating school lunches.

Boys entitled to reduced-price meals, but who did not take them, also had lower energy, vitamin A, and iron intakes, than the boys who accepted their reduced-price school lunches. On the other hand, the girls entitled to reduced-price lunches, but who did not take them had higher energy, protein, and iron intakes but lower intakes of calcium, vitamin A, ascorbic acid, and thiamin than the girls receiving reduced-price lunches.

TABLE 13

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES WHO RECEIVED FREE, REDUCED-PRICE, AND PAID-IN-FULL HOT SCHOOL LUNCHES

Energy And Nutrients	Free n=55 Mean Intake	Free n=55 RDA %	Reduced-Price n=14 Mean Intake	Reduced-Price n=14 RDA %	Paid-In-Full n=21 Mean Intake	Paid-In-Full n=21 RDA %
Food Energy, kcal.	705 ± 120[1]	24	762 ± 187[1]	26	715 ± 213[1]	25
Protein, gm.	28.4 ± 6.2	64	31.7 ± 8.6	71	28.3 ±10.7	63
Fat, gm.	35.6 ± 7.5	--	39.3 ± 9.1	--	36.3 ±13.0	--
Carbohydrates, gm.	69.2 ±12.5	--	71.4 ±24.1	--	70.2 ±16.4	--
Fiber, gm.	1.2 ± 0.4	--	1.3 ± 0.6	--	1.3 ± 0.5	--
Calcium, mg.	368 ± 66	30	396 ± 169	32	342 ± 125	27
Phosphorous, mg.	479 ± 83	39	524 ± 162	43	466 ± 160	38
Iron, mg.	3.4 ± 0.9	18	3.9 ± 1.7	20	3.5 ± 1.0	19
Sodium, mg.	1066 ± 339	--	1198 ± 696	--	1114 ± 396	--
Potassium, mg.	992 ± 167	--	1094 ± 335	--	996 ± 288	--
Vitamin A, IU	2134 ±1535	42	1732 ±1103	34	2314 ±2185	45
Thiamin, mg.	0.41 ±0.12	28	0.51 ±0.18	36	0.41 ±0.19	28
Riboflavin, mg.	0.69 ±0.12	45	0.78 ±0.30	51	0.65 ±0.22	42
Niacin, mg.	4.5 ± 1.2	24	5.2 ± 1.7	28	4.6 ± 1.5	24
Ascorbic Acid, mg.	15.1 ± 4.9	33	20.2 ±15.4	44	16.6 ± 9.0	36
Sat. Fatty Acid, gm.	13.2 ± 2.8	--	15.1 ± 4.0	--	13.1 ± 4.5	--
Unsat. Oleic Acid, gm.	12.6 ± 3.1	--	14.1 ± 3.9	--	12.8 ± 4.7	--
Unsat. Linoleic Acid, gm.	5.4 ± 1.6	--	5.2 ± 1.7	--	5.9 ± 3.1	--
Cholesterol, mg.	96.2 ±19.8	--	108.4 ±26.6	--	94.9 ±34.4	--

[1] Standard deviation.

TABLE 14

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF FEMALES WHO RECIEVED FREE, REDUCED-PRICE, AND PAID-IN-FULL HOT SCHOOL LUNCHES

Energy And Nutrients	Free n=39		Reduced-Price n=4		Paid-In-Full n=22	
	Mean Intake	RDA %	Mean Intake	RDA %	Mean Intake	RDA %
Food Energy, kcal.	621 ± 146[1]	25	665 ± 134[1]	27	684 ± 172[1]	27
Protein, gm.	24.1 ± 7.0	54	28.1 ± 5.4	63	26.5 ± 6.9	59
Fat, gm.	32.2 ±10.2	--	34.5 ± 7.5	--	35.3 ±11.2	--
Carbohydrates, gm.	60.2 ±12.5	--	61.5 ±12.0	--	66.6 ±16.0	--
Fiber, gm.	1.1 ± 0.4	--	0.9 ± 0.4	--	1.2 ± 0.6	--
Calcium, mg.	309 ± 95	25	367 ± 39	30	338 ±97.1	27
Phosphorous, mg.	401 ± 102	32	474 ± 68	39	446 ± 116	36
Iron, mg.	3.0 ± 1.0	16	3.0 ± 0.9	16	3.3 ± 1.0	18
Sodium, mg.	942 ± 434	--	954 ± 389	--	1108 ± 488	--
Potassium, mg.	846 ± 195	--	978 ± 120	--	950 ± 267	--
Vitamin A, IU	1792 ±1546	44	1503 ±1739	37	1573 ±1793	38
Thiamin, mg.	0.37 ±0.15	30	0.42 ±0.08	35	0.37 ±0.12	30
Riboflavin, mg.	0.59 ±0.16	44	0.68 ±0.10	51	0.65 ±0.16	49
Niacin, mg.	4.0 ± 1.2	24	4.4 ± 0.9	26	4.3 ± 1.2	26
Ascorbic Acid, mg.	12.2 ± 4.9	26	13.8 ± 3.0	30	14.0 ± 6.7	30
Sat. Fatty Acid, gm.	11.9 ± 3.8	--	13.4 ± 2.5	--	13.0 ± 3.5	--
Unsat. Oleic Acid, gm.	11.4 ± 4.2	--	12.1 ± 3.1	--	12.6 ± 4.0	--
Unsat. Linoleic Acid, gm.	4.8 ± 1.8	--	4.6 ± 1.5	--	5.8 ± 3.3	--
Cholesterol, mg.	83.2 ±25.7	--	98.0 ±16.8	--	91.1 ±24.9	--

[1]Standard deviation.

TABLE 15

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES WHO RECEIVED FREE, REDUCED-PRICE, AND PAID-IN-FULL COLD SCHOOL LUNCHES

	Free n=42		Reduced-Price n=2		Paid-In-Full n=11	
Energy And Nutrients	Mean Intake	RDA %	Mean Intake	RDA %	Mean Intake	RDA %
Food Energy, kcal.	630 ± 224[1]	22	612 ± 446[1]	21	596 ± 153[1]	21
Protein, gm.	22.3 ± 8.1	50	19.8 ±13.2	44	20.5 ± 6.6	46
Fat, gm.	26.2 ± 9.4	--	29.4 ±25.1	--	21.5 ± 6.8	--
Carbohydrates, gm.	78.8 ±30.8	--	68.9 ±41.5	--	82.6 ±18.9	--
Fiber, gm.	1.1 ± 0.6	--	1.2 ± 1.1	--	1.3 ± 0.7	--
Calcium, mg.	415 ± 98	34	359 ± 175	29	318 ± 144	25
Phosphorous, mg.	430 ± 118	35	379 ± 212	31	353 ± 119	29
Iron, mg.	2.8 ± 1.4	14	2.4 ± 1.8	13	3.0 ± 1.1	15
Sodium, mg.	963 ± 529	--	1066 ±1107	--	997 ± 328	--
Potassium, mg.	800 ± 236	--	654 ± 236	--	629 ± 249	--
Vitamin A, IU	688 ± 239	13	626 ± 411	12	640 ± 274	12
Thiamin, mg.	0.37 ±0.16	26	0.26 ±0.19	18	0.34 ±0.14	24
Riboflavin, mg.	0.68 ±0.17	44	0.59 ±0.34	39	0.50 ±0.21	32
Niacin, mg.	3.6 ± 1.7	19	3.0 ± 1.4	16	3.9 ± 1.8	21
Ascorbic Acid, mg.	31.0 ±22.3	68	10.3 ± 5.6	22	32.9 ±21.8	72
Sat. Fatty Acid, gm.	10.2 ± 3.4	--	10.4 ± 8.0	--	7.4 ± 2.5	--
Unsat. Oleic Acid, gm.	10.2 ± 4.1	--	10.4 ± 8.0	--	8.5 ± 2.7	--
Unsat. Linoleic Acid, gm.	1.8 ± 1.0	--	3.7 ± 3.7	--	2.1 ± 1.7	--
Cholesterol, mg.	76.6 ±32.6	--	65.4 ±54.5	--	54.2 ±20.1	--

[1] Standard deviation.

TABLE 16

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF FEMALES WHO RECEIVED FREE, REDUCED-PRICE, AND PAID-IN-FULL COLD SCHOOL LUNCHES

Energy And Nutrients	Free n=30 Mean Intake	RDA %	Reduced-Price n=5 Mean Intake	RDA %	Paid-In-Full n=9 Mean Intake	RDA %
Food Energy, kcal.	512 ± 157[1]	20	552 ± 142[1]	22	575 ± 210[1]	23
Protein, gm.	16.8 ± 4.7	37	19.6 ± 5.0	44	18.4 ± 7.6	41
Fat, gm.	20.4 ± 6.8	--	20.9 ± 7.2	--	22.2 ±10.1	--
Carbohydrates, gm.	67.9 ±22.8	--	73.8 ±15.8	--	77.0 ±30.9	--
Fiber, gm.	1.1 ± 0.6	--	1.2 ± 0.4	--	0.8 ± 0.6	--
Calcium, mg.	336 ± 86	27	391 ± 56	32	281 ± 111	22
Phosphorous, mg.	339 ± 87	27	388 ± 55	31	319 ± 110	26
Iron, mg.	2.1 ± 0.8	11	2.1 ± 0.8	11	2.4 ± 1.2	12
Sodium, mg.	663 ± 277	--	755 ± 262	--	993 ± 437	--
Potassium, mg.	720 ± 208	--	694 ± 146	--	508 ± 275	--
Vitamin A, IU	579 ± 187	14	732 ± 94	17	556 ± 209	13
Thiamin, mg.	0.30 ±0.10	24	0.26 ±0.10	21	0.27 ±0.17	22
Riboflavin, mg.	0.55 ±0.12	41	0.58 ±0.07	44	0.44 ±0.20	33
Niacin, mg.	2.7 ± 1.2	16	3.0 ± 1.7	18	3.1 ± 2.0	18
Ascorbic Acid, mg.	33.9 ±31.1	74	26.3 ±19.3	57	27.0 ±20.0	59
Sat. Fatty Acid, gm.	7.9 ± 2.2	--	7.9 ± 1.9	--	7.6 ± 4.2	--
Unsat. Oleic Acid, gm.	7.7 ± 2.7	--	7.8 ± 2.8	--	8.8 ± 4.0	--
Unsat. Linoleic Acid, gm.	1.5 ± 1.3	--	1.6 ± 2.0	--	2.0 ± 1.9	--
Cholesterol, mg.	55.8 ±16.0	--	66.1 ±18.4	--	57.1 ±28.7	--

[1] Standard deviation.

TABLE 17

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES AND FEMALES ENTITLED TO FREE, AND REDUCED-PRICE SCHOOL LUNCHES BUT DID NOT TAKE

	Males				Females			
	Free n=21		Reduced-Price n=2		Free n=17		Reduced-Price n=3	
Energy And Nutrients	Mean Intake	RDA %	Mean Intake	RDA %	Mean Intake	RDA %	Mean Intake	RDA %
Food Energy, kcal.	634 ± 215[1]	22	534 ± 451[1]	18	555 ± 224[1]	22	646 ± 114[1]	26
Protein, gm.	20.1 ± 9.8	45	19.0 ±17.7	42	19.2 ± 7.7	43	24.3 ± 3.8	54
Fat, gm.	26.7 ±10.9	--	24.1 ±23.4	--	23.8 ±10.1	--	27.3 ± 6.3	--
Carbohydrates, gm.	80.7 ±28.7	--	61.6 ±41.9	--	67.8 ±33.7	--	76.8 ±11.4	--
Fiber, gm.	0.9 ± 0.5	--	0.8 ± 0.6	--	0.7 ± 0.5	--	0.6 ± 0.2	--
Calcium, mg.	314 ± 157	25	300 ± 168	24	281 ± 156	22	264 ± 152	21
Phosphorous, mg.	360 ± 158	29	330 ± 230	27	332 ± 162	27	361 ± 83	29
Iron, mg.	2.8 ± 1.4	14	2.8 ± 2.9	15	2.6 ± 1.2	14	3.2 ± 0.9	17
Sodium, mg.	958 ± 580	--	1006 ±1174	--	916 ± 497	--	844 ± 268	--
Potassium, mg.	654 ± 220	--	692 ± 331	--	542 ± 288	--	555 ± 41	--
Vitamin A, IU	558 ± 282	10	464 ± 183	8	439 ± 230	10	471 ± 241	11
Thiamin, mg.	0.33 ±0.16	23	0.32 ±0.33	22	0.31 ±0.14	25	0.26 ±0.03	21
Riboflavin, mg.	0.53 ±0.24	35	0.55 ±0.41	36	0.49 ±0.20	36	0.49 ±0.16	37
Niacin, mg.	3.3 ± 1.6	17	3.2 ± 3.6	17	3.4 ± 1.6	20	4.8 ± 1.7	29
Ascorbic Acid, mg.	26.6 ±30.3	58	15.9 ±11.3	35	13.6 ±20.5	29	3.8 ± 1.6	8
Sat. Fatty Acid, gm.	9.8 ± 3.7	--	9.6 ± 8.7	--	9.4 ± 4.0	--	10.3 ± 1.3	--
Unsat. Oleic Acid, gm.	9.8 ± 4.1	--	9.4 ± 9.2	--	9.1 ± 4.2	--	10.3 ± 1.8	--
Unsat. Linoleic Acid, gm.	3.7 ± 3.1	--	1.5 ± 2.0	--	2.2 ± 1.6	--	3.5 ± 2.2	--
Cholesterol, mg.	77.2 ±35.1	--	61.8 ±55.3	--	72.7 ±28.4	--	86.6 ±17.8	--

[1]Standard deviation.

Lunches Eaten At Home

The average nutrient intake from 395 meals eaten at home by 41 boys and 49 girls was compared with the average nutrient intake from the Hot and Cold School Lunches (Tables 18, 19). Only one boy and three girls from public schools went home for lunch.

The nutritional intake from the lunches eaten at home did not meet the goal of supplying one-third of the RDA (88) for all nutrients, but met one-fourth of the RDA (88) except for iron and vitamin A for both sexes and calcium for the girls and thiamin for the boys. Boys consumed significantly ($p < 0.01$) more fat, vitamin A, and thiamin from hot school lunches than from meals eaten at home. Girls consumed significantly ($p < 0.01$) less ascorbic acid but more protein, fat, calcium, vitamin A, and riboflavin, from hot school lunches than from lunches eaten at home. Caloric intake was similar whether meals were eaten at home or were consumed as hot school lunches.

When lunches eaten at home were compared with cold school lunches, the boys had significantly higher intakes from home lunches for calories ($p < 0.05$), protein ($p < 0.01$), fat ($p < 0.01$), iron ($p < 0.01$), vitamin A ($p < 0.01$), and niacin ($p < 0.01$), but lower intake of ascorbic acid ($p < 0.01$). The girls had also significantly higher intakes from home lunches for calories ($p < 0.01$), protein ($p < 0.01$), fat ($p < 0.01$), iron ($p < 0.01$), vitamin A ($p < 0.01$), thiamin ($p < 0.05$), and niacin ($p < 0.01$). Only the calcium intake for girls and the ascorbic acid intake for boys were higher ($p < 0.01$) from the cold school lunches than from meals eaten at home.

TABLE 18

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES AND FEMALES WHO ATE LUNCH AT HOME

Energy And Nutrients	Males n=41 Mean Intake	Males RDA %	Males Below 1/3 RDA %	Females n=49 Mean Intake	Females RDA %	Females Below 1/3 RDA %
Food Energy, kcal.	725 ± 229[1]	25	82	630 ± 195[1]	25	81
Protein, gm.	26.5 ±10.2	59	9	21.4 ± 7.7	48	18
Fat, gm.	31.6 ±12.9	--	--	28.3 ±11.5	--	--
Carbohydrates, gm.	84.4 ±27.9	--	--	74.2 ±24.1	--	--
Fiber, gm.	0.7 ± 0.4	--	--	0.8 ± 0.5	--	--
Calcium, mg.	356 ± 233	29	68	257 ± 164	20	83
Phosphorous, mg.	447 ± 211	36	39	354 ± 160	29	67
Iron, mg.	3.5 ± 1.1	18	97	3.3 ± 1.1	17	95
Sodium, mg.	1235 ± 557	--	--	1058 ± 290	--	--
Potassium, mg.	763 ± 337	--	--	666 ± 247	--	--
Vitamin A, IU	1050 ± 884	20	80	845 ± 655	20	81
Thiamin, mg.	0.34 ±0.11	23	85	0.34 ±0.13	28	73
Riboflavin, mg.	0.63 ±0.34	41	31	0.48 ±0.24	36	51
Niacin, mg.	4.9 ± 2.3	26	70	4.2 ± 1.6	25	77
Ascorbic Acid, mg.	16.5 ±18.7	36	56	25.3 ±25.6	55	46
Sat. Fatty Acid, gm.	12.6 ± 6.5	--	--	10.8 ± 5.3	--	--
Unsat. Oleic Acid, gm.	11.6 ± 4.7	--	--	10.2 ± 4.3	--	--
Unsat. Linoleic Acid, gm.	3.3 ± 1.9	--	--	3.8 ± 2.6	--	--
Cholesterol, mg.	114.3 ±67.6	--	--	94.1 ±75.0	--	--

[1]Standard deviation.

TABLE 19

STATISTICAL SIGNIFICANCE OF NUTRIENT INTAKE OF LUNCHES EATEN-AT-HOME VERSUS COLD OR HOT SCHOOL LUNCHES

Parameter	Eaten At Home vs. Cold: Sig.[1]	Eaten At Home vs. Cold: Greater Value	Eaten At Home vs. Hot: Sig.	Eaten At Home vs. Hot: Greater Value
Calories, M	$p < 0.05$	At Home	NS	--
F	$p < 0.01$	At Home	NS	--
Protein, M	$p < 0.01$	At Home	NS	--
F	$p < 0.01$	At Home	$p < 0.01$	Hot
Fat, M	$p < 0.01$	At Home	$p < 0.01$	Hot
F	$p < 0.01$	At Home	$p < 0.01$	Hot
Calcium, M	NS	--	NS	--
F	$p < 0.01$	Cold	$p < 0.01$	Hot
Iron, M	$p < 0.01$	At Home	NS	--
F	$p < 0.01$	At Home	NS	--
Vitamin A, M	$p < 0.01$	At Home	$p < 0.01$	Hot
F	$p < 0.01$	At Home	$p < 0.01$	Hot
Thiamin, M	NS	--	$p < 0.01$	Hot
F	$p < 0.05$	At Home	NS	--
Riboflavin, M	NS	--	NS	--
F	NS	--	$p < 0.01$	Hot
Niacin, M	$p < 0.01$	At Home	NS	--
F	$p < 0.01$	At Home	NS	--
Ascorbic Acid, M	$p < 0.01$	Cold	NS	--
F	NS	--	$p < 0.01$	At Home

[1] Significance determined by the t test.

Lunches Brought From Home

The average nutrient intake from 576 lunches brought from home by 84 boys and 70 girls was compared with the average nutrient intake from Hot and Cold School Lunches (Tables 20, 21). The average intake from the lunches brought from home did not meet the goal of supplying one-third of the RDA (88) for all nutrients, but also fell below one-fourth of the RDA (88) for calcium, iron, vitamin A, and niacin for both sexes plus energy and thiamin for the boys.

Boys consumed from hot school lunches significantly higher amounts of every nutrient except ascorbic acid, which was significantly higher ($p < 0.05$) from lunches brought from home. The girls receiving hot school lunches had significantly higher intakes of protein ($p < 0.01$), fat ($p < 0.01$), calcium ($p < 0.05$), vitamin A ($p < 0.01$), thiamin ($p < 0.05$), and riboflavin ($p < 0.01$) than the girls who brought lunches from home. Intakes were similar for energy, iron, and niacin. Ascorbic acid intake from lunches brought from home met one-third of the RDA (88), while the intake from hot school lunches fell below that goal.

When compared with cold lunches, the boys who consumed the cold school lunches had significantly higher intakes of calcium ($p < 0.01$), vitamin A ($p < 0.01$), riboflavin ($p < 0.01$), and ascorbic acid ($p < 0.05$), than the boys who brought lunches from home. The girls who consumed the cold school lunches also had higher intakes of calcium ($p < 0.05$) and ascorbic acid ($p < 0.05$), but a lower intake of calories ($p < 0.01$), protein ($p < 0.05$), fat ($p < 0.01$), iron ($p < 0.01$), thiamin ($p < 0.05$), and niacin ($p < 0.01$) than the girls who brought lunches from home.

TABLE 20

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES AND FEMALES WHO BROUGHT LUNCHES FROM HOME

	Males n=84			Females n=70		
Energy And Nutrients	Mean Intake	RDA %	Below 1/3 RDA %	Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	665 ± 197[1]	22	90	631 ± 213[1]	25	77
Protein, gm.	20.8 ± 8.8	46	26	20.3 ± 7.4	45	24
Fat, gm.	28.6 ±12.5	--	--	27.6 ±10.9	--	--
Carbohydrates, gm.	80.6 ±23.2	--	--	77.6 ±29.1	--	--
Fiber, gm.	0.8 ± 0.6	--	--	0.8 ± 0.5	--	--
Calcium, mg.	268 ± 168	21	80	274 ± 165	22	87
Phosphorous, mg.	347 ± 164	28	64	343 ± 150	28	71
Iron, mg.	3.1 ± 1.2	16	98	3.1 ± 1.0	16	100
Sodium, mg.	983 ± 425	--	--	975 ± 386	--	--
Potassium, mg.	615 ± 253	--	--	605 ± 252	--	--
Vitamin A, IU	497 ± 358	9	98	529 ± 408	12	95
Thiamin, mg.	0.34 ±0.13	23	83	0.34 ±0.12	27	70
Riboflavin, mg.	0.48 ±0.25	31	55	0.49 ±0.25	37	41
Niacin, mg.	4.1 ± 2.0	22	86	3.9 ± 1.7	23	80
Ascorbic Acid, mg.	21.3 ±26.4	46	57	20.7 ±31.7	45	64
Sat. Fatty Acid, gm.	10.1 ± 5.1	--	--	9.9 ± 4.1	--	--
Unsat. Oleic Acid, gm.	10.6 ± 4.4	--	--	10.5 ± 4.5	--	--
Unsat. Linoleic Acid, gm.	4.6 ± 3.1	--	--	3.9 ± 2.7	--	--
Cholesterol, mg.	84.5 ±110.1	--	--	77.9 ±40.0	--	--

[1]Standard deviation.

TABLE 21

STATISTICAL SIGNIFICANCE OF NUTRIENT INTAKE OF LUNCHES BROUGHT-FROM-HOME VERSUS COLD OR HOT SCHOOL LUNCHES

	From Home vs. Cold		From Home vs. Hot	
Parameter	Sig.[1]	Greater Value	Sig.[1]	Greater Value
Kcalories, M	NS	--	p 0.05	Hot
F	$p < 0.01$	From Home	NS	--
Protein, M	NS	--	$p < 0.01$	Hot
F	$p < 0.05$	From Home	$p < 0.01$	Hot
Fat, M	NS	--	$p < 0.01$	Hot
F	$p < 0.01$	From Home	$p < 0.01$	Hot
Calcium, M	$p < 0.01$	Cold	$p < 0.01$	Hot
F	$p < 0.05$	Cold	$p < 0.05$	Hot
Iron, M	NS	--	$p < 0.05$	Hot
F	$p < 0.01$	From Home	NS	--
Vitamin A, M	$p < 0.01$	Cold	$p < 0.01$	Hot
F	NS	--	$p < 0.01$	Hot
Thiamin, M	NS	--	$p < 0.01$	Hot
F	$p < 0.05$	From Home	$p < 0.05$	Hot
Riboflavin, M	$p < 0.01$	Cold	$p < 0.01$	Hot
F	NS	--	$p < 0.01$	Hot
Niacin, M	NS	--	$p < 0.05$	Hot
F	$p < 0.01$	From Home	NS	--
Ascorbic Acid, M	$p < 0.05$	Cold	$p < 0.05$	From Home
F	$p < 0.05$	Cold	$p < 0.05$	From Home

[1] Significance determined by the t test.

The nutrient intake from lunches brought from home by public school boys, was compared to the nutrient intake from lunches brought from home by non-public school boys, and it was found to be lower in all nutrients except vitamin A and ascorbic acid. Comparing public school girls to non-public school girls, the former had a higher intake of calcium but a lower intake of iron, vitamin A, and ascorbic acid (Table 22).

Other Evaluation of Nutrient Intake

Of the 310 students who were asked if they were taking vitamins, they responded with the following answers:

52 students took vitamins every day
31 students took vitamins sometimes
133 students never took vitamins

An extra nutritional contribution to the meals was made by vitamins taken by 26.8 percent of the children.

As shown in Table 23, the intake of fiber from the Hot and Cold School Lunches and those brought from home was similar. Sodium intakes were slightly higher from Hot School Lunches and lunches eaten at home. Cholesterol intake was higher in Hot School Lunches and lunches eaten at home.

As shown in Table 24, all lunches were typical of the current U. S. diet with protein and fat supplying approximately 14 and 41 percent of the total calories, respectively. The Hot School Lunches, however, supplied approximately 16 percent of the total calories from protein and 45 percent from fat. These levels exceed the current U. S. Dietary Goals (89).

Table 25 shows that the Ca:P and P/S ratios are within acceptable values.

TABLE 22

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF PUBLIC AND NON-PUBLIC SCHOOL MALES AND FEMALES WHO BROUGHT LUNCHES FROM HOME

Energy And Nutrients	Males: Public Schools n=63 Mean Intake	RDA %	Males: Non-Public Schools n=21 Mean Intake	RDA %	Females: Public Schools n=51 Mean Intake	RDA %	Females: Non-Public Schools n=19 Mean Intake	RDA %
Food Energy, kcal.	632 ± 199[1]	22	724 ± 180[1]	25	636 ± 223[1]	26	616 ± 188[1]	25
Protein, gm.	20.0 ± 9.0	45	23.4 ± 7.8	52	21.1 ± 7.6	47	18.1 ± 6.5	40
Fat, gm.	27.5 ±12.4	--	32.1 ±12.4	--	28.1 ±11.0	--	26.0 ±10.7	--
Carbohydrates, gm.	78.4 ±22.3	--	87.4 ±25.2	--	76.8 ±31.5	--	79.7 ±21.7	--
Fiber, gm.	0.9 ± 0.6	--	0.7 ± 0.6	--	0.8 ± 0.5	--	0.7 ± 0.3	--
Calcium, mg.	267 ± 171	21	268 ± 162	21	291 ± 176	23	277 ± 125	18
Phosphorous, mg.	338 ± 170	27	376 ± 145	30	358 ± 157	29	304 ± 125	24
Iron, mg.	3.0 ± 1.2	16	3.5 ± 0.9	18	3.0 ± 1.0	16	3.3 ± 1.1	18
Sodium, mg.	967 ± 457	--	1031 ± 312	--	987 ± 404	--	944 ± 340	--
Potassium, mg.	609 ± 244	--	633 ± 283	--	585 ± 256	--	659 ± 238	--
Vitamin A, IU	513 ± 387	9	447 ± 252	8	471 ± 246	11	684 ± 659	16
Thiamin, mg.	0.34 ±0.13	23	0.34 ±0.13	23	0.33 ±0.13	27	0.35 ±0.11	29
Riboflavin, mg.	0.48 ±0.26	31	0.49 ±0.25	32	0.51 ±0.25	38	0.46 ±0.24	34
Niacin, mg.	3.8 ± 1.9	20	5.0 ± 2.0	27	3.9 ± 1.8	23	3.9 ± 1.4	24
Ascorbic Acid, mg.	24.5 ±27.1	53	11.9 ±22.0	26	14.8 ±18.0	32	36.7 ±50.8	80
Sat. Fatty Acid, gm.	9.6 ± 4.6	--	11.7 ± 6.0	--	10.1 ± 4.1	--	9.4 ± 4.0	--
Unsat. Oleic Acid, gm.	10.0 ± 4.2	--	12.2 ± 4.7	--	10.8 ± 4.8	--	9.8 ± 3.9	--
Unsat. Linoleic Acid, gm.	4.4 ± 3.4	--	4.9 ± 2.2	--	3.9 ±2.87	--	3.8 ± 2.4	--
Cholesterol, mg.	85.2 ±125.0	--	82.4 ±43.7	--	84.2 ±41.9	--	60.9 ±29.0	--

[1] Standard deviation.

TABLE 23

FIBER, SODIUM, AND CHOLESTEROL INTAKE
FROM FIVE TYPES OF LUNCHES

Type of Lunch	Fiber gm.		Sodium mg.		Cholesterol mg.	
	Males	Females	Males	Females	Males	Females
All Lunches	1.0	1.0	1088	968	92.4	81.0
Hot School Lunches	1.2	1.1	1098	998	97.8	86.8
Cold School Lunches	1.2	1.0	974	741	71.7	57.2
Lunches Eaten At Home	0.7	0.8	1235	1058	114.3	94.1
Lunches Brought From Home	0.8	0.8	983	975	84.5	77.9

TABLE 24

PERCENTAGE OF CALORIES FROM PROTEIN, FAT AND CARBOHYDRATES
FOR FIVE TYPES OF LUNCHES

Type of Lunch	Protein		Fat		Carbohydrates	
	Males	Females	Males	Females	Males	Females
All Lunches	14	14	41	41	45	46
Hot School Lunches	16	16	45	46	39	38
Cold School Lunches	14	13	36	35	50	52
Lunches Eaten At Home	15	13	39	40	46	47
Lunches Brought From Home	12	13	39	39	49	48

TABLE 25

CA:P RATIO AND P/S RATIO FOR FIVE TYPES OF LUNCHES

Type of Lunch	CA:P Ratio		P/S Ratio	
	Males	Females	Males	Females
All Lunches	1:1.24	1:1.25	1.34	1.35
Hot School Lunches	1:1.31	1:1.30	1.36	1.37
Cold School Lunches	1:1.13	1:1.03	1.22	1.21
Lunches Eaten At Home	1:1.25	1:1.37	1.18	1.29
Lunches Brought From Home	1:1.29	1:1.25	1.50	1.45

V. SUMMARY AND CONCLUSIONS

The nutritive value of Cold and Hot Type A School Lunches and home lunches was compared in this study. Acceptability between Hot and Cold Type A School Lunches was measured by participation and amount of plate waste.

A total of 1,965 meals consumed by 495 children, (266 boys and 229 girls), were calculated for nutritional content. The study involved all sixth-grade children, in both public and non-public schools, in the city of Central Falls, Rhode Island. During Phase I, data were collected on participation, plate waste, and nutritive value of a Cold Type A School Lunch available in public schools. This was compared with the values for lunches eaten at home or brought from home by public and non-public school children. Data were collected for a five-day period.

Since a Hot Lunch became available during the next school year, Phase II determined participation, waste, and nutrient value of the Hot Type A School Lunch. Observations were made for two five-day periods, and compared with data obtained during Phase I. Nutrient contents and intakes and percent RDA (88) were determined by a computer program based on USDA Handbook No. 8 (84).

Evaluation of the results obtained permits the following conclusions:

1. During the study, an average of 39 percent of the sixth-grade public school children obtained the Cold Type A School Lunch. When the Hot School Lunch became available participation rose to 64 percent.

2. None of the Hot or Cold Type A School Lunches contained the recommended goal of one-third of the RDA (88) for all nutrients, for boys and girls 11 to 14 years old. In these lunches, fat provided 35 percent of the total calories in Cold School Lunches and 44 percent of the total calories in Hot School Lunches.

3. Plate waste was lower than expected due to food exchange and the size of the portions served. Nutrient losses from plate waste, due largely to the sandwich being discarded, were generally greater from the Cold School Lunch. In the Hot School Lunch, vitamin A from vegetables was the nutrient most wasted.

4. The average nutrient intake from the Hot Type A School Lunches did not meet the goal of one-third of the RDA (88), but met one-fourth of the RDA (88) for boys and girls for all nutrients except iron. The average nutrient intake from the Cold Type A School Lunch was below the goal of supplying one-third of the RDA (88) for all nutrients. The average nutrient intake from the Cold School Lunch fell below one-fourth of the RDA (88) for food energy, iron, vitamin A, and niacin for both sexes and for thiamin for girls.

5. The public school boys had significantly higher intakes of vitamin A, thiamin, and ascorbic acid and lower intakes of calories and niacin than the non-public school boys. The public school girls consumed significantly more calcium and riboflavin, but significantly less iron, niacin, and ascorbic acid than the non-public school girls.

6. Lunches eaten at home provided more calories, protein, fat, iron, vitamin A, and niacin than the Cold Type A School Lunches. The intake of calcium for the girls and of ascorbic acid for the boys were higher from the Cold School Lunch.

7. The children consumed from the Hot Type A School Lunch similar or higher amounts of every nutrient, except ascorbic acid, than they did from the lunches they brought from home. The boys who obtained the Cold Type A School Lunch had higher intakes of calcium, vitamin A, riboflavin, and ascorbic acid than the boys who brought lunches from home. The girls choosing the Cold Type A School Lunch also had higher intakes of calcium and ascorbic acid but lower intakes of calories, protein, fat, iron, thiamin, and niacin, than the girls who brought their lunches from home.

In general, the results of this study showed that the Type A School Lunch failed to meet the goal of one-third of the RDA (88) for all nutrients. The nutrient intake was below one-fourth of the RDA (88) for energy and three nutrients for boys and for energy and four nutrients for girls. While the Hot Type A School Lunch did not meet the goal of supplying one-third of the RDA (88), the average nutrient intake met one-fourth of the RDA (88) for boys and girls for all nutrients except iron. Participation increased when the Hot Type A School Lunches replaced the Cold Type A School Lunch.

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APPENDIX A

COLD AND HOT MENUS

COLD MENUS

Monday - May 20, 1974

Peanut Butter Sandwich with Jelly
Apple
Vanilla Cream Sandwich Cookie
Milk

Tuesday - May 21, 1974

Bologna Sandwich
Florida Orange
Chocolate Chip Cookie
Milk

Wednesday - May 22, 1974

Pork Loaf Sandwich
Banana
Oatmeal Cookie
Milk

Thursday - May 23, 1974

Ham and Cheese Sandwich
Orange
Lemon Cookie
Milk

Friday -- May 24, 1974

Cheese Pizza
Apple
Chocolate Sandwich Cookie
Milk

HOT MENUS - SCHOOL NO. I

Monday - December 2, 1974

Frankfurter with Roll
Mustard and Sweet Relish
Green Beans
Potato Chips
Chilled Fruit Cup

Tuesday - December 3, 1974

Sausage Links
Whipped Potato
Carrots
Bread with Butter
Chilled Applesauce
Milk

Wednesday - December 4, 1974

Meat Loaf with Brown Gravy
Whipped Potato
Green Peas
Bread with Butter
Yellow Cake with Mocha Icing
Milk

Thursday - December 5, 1974

Italian Macaroni with Meat Balls
Tossed Salad
Bread with Butter
Canned Peaches
Milk

Friday - December 6, 1974

Pork Fritters
French Fries
Cole Slaw
Bread with Butter
Apple and Pear Sauce
Milk

HOT MENUS - SCHOOL 2

Monday - February 3, 1975

Frankfurter with Roll
Mustard and Sweet Relish
Green Beans
Potato Chips
Chilled Fruit Cocktail
Milk

Tuesday - February 4, 1975

Hamburg Delight
Parslied Potatoes
Sliced Carrots
Bread with Butter
Chocolate Chip Cookie
Milk

Wednesday - February 5, 1975

Fish Portion
Tartar Sauce and Catsup
Parsley Potato
Corn Niblets
Bread with Butter
Peanut Butter Cookie
Milk

Thursday - February 6, 1975

Pork with Brown Gravy
Whipped Potato
Green Peas
Bread with Butter
Vanilla Parfait
Milk

Friday - February 7, 1975

Fish Sticks
Parsley Potato
Cole Slaw
Bread with Butter
Chocolate Cake with White Icing
Milk

APPENDIX B

FAMILY SIZE INCOME SCALE FOR FREE AND REDUCED-PRICE LUNCHES

ATTACHMENT A

FAMILY SIZE INCOME SCALE FOR FREE MEALS

This is the income scale used by ______________________________
School Food Authority

to determine eligibility for free meals and free milk in the ________
date

school year.

STATE OF RHODE ISLAND

INCOME POVERTY GUIDELINES, FISCAL 1975

Family Size	Maximum Income for Free Lunch and Free Milk
One	$ 2,910
Two	3,830
Three	4,740
Four	5,640
Five	6,480
Six	7,310
Seven	8,060
Eight	8,810
Nine	9,510
Ten	10,190
Eleven	10,860
Twelve	11,530
Each additional family member	670

ATTACHMENT B

FAMILY SIZE INCOME SCALE FOR
REDUCED-PRICE MEALS

This is the income scale used by ______________________________
School Food Authority

to determine eligibility for reduced-price meals in the ____________
date

school year.

STATE OF RHODE ISLAND

INCOME POVERTY GUIDELINES, FISCAL 1975

Family Size	Maximum Income for Reduced-Price Lunch
One	$ 4,080
Two	5,360
Three	6,630
Four	7,900
Five	9,070
Six	10,240
Seven	11,290
Eight	12,340
Nine	13,320
Ten	14,260
Eleven	15,200
Twelve	16,140
Each additional family member	940

APPENDIX C

DIETARY RECORD AND INSTRUCTION SHEETS

Directions for Completing your Lunch Record

1. Write your name, date and name of your school on the top of the page.
2. Write down everything you had for lunch.

If you had soup, tell what kind of soup and how much (1 cup, 1/2 cup).

If you had a sandwich, tell how many slices of bread (such as 2 slices of white bread, 1 slice of Italian bread, 1 hamburger roll, 1 frankfort roll). Also tell what was inside the sandwich (such as 1 slice of bologna, 1 hamburger, 1 hot dog, 2 tablespoons of peanut butter, 2 tablespoons of jelly). These are just examples. You may have had more or less of these or even something else. In any case, be sure to tell us just what you had.

If you had spaghetti or macaroni tell how much such as 1 cup, 1/2 cup or 1/4 cup. If there were meatballs, tell how many.

If you had potato, tell whether it was french fried, baked, boiled or mashed. Also, be sure to say if you had anything on it such as catsup, butter, or gravy.

If you had fruit, tell what kind of fruit. If you had cake, cookies, or candy tell what kind and how much. For example, 1 slice of chocolate cake with frosting, 1 devil dog, 1 twinkie, 2 chocolate chip cookies, 1 Milky Way candy bar.

Don't forget to tell what you had to drink such as milk, coke, soda, or tea. If you had coffee or tea, tell us how much milk and sugar was in it.

Also, don't forget to tell us the butter on bread or milk and sugar on cereal.

You may want to ask your mother to help you with this record.

THANK YOU.

DIETARY RECORD

NAME: SUSAN JONES DATE: 5/28/74

SCHOOL: ELLA RISK

TIME	FOOD ITEM	DESCRIPTION	AMOUNT EATEN
LUNCH AT HOME	SOUP	TOMATO	1 CUP
	SANDWICH	WHITE BREAD BOLOGNA	2 SLICES 1 SLICE
	FRUIT	APPLE	1 MEDIUM
	CANDY	MILKY WAY	1 BAR
	CAKE	LAYER WITH FROSTING	1 SLICE
	MILK		2 CUPS

E X A M P L E

APPENDIX D

PORTION CONTROL CHARTS

SCHOOL LUNCH PROGRAMS
GUIDELINES FOR THE AMOUNTS OF FOODS FOR BOYS AND GIRLS OF SPECIFIED AGES

Pattern	Pre-School Children (3 up to 6 years)	Elementary School Children (6 up to 10 years)	Elementary School Children (10 up to 12 years)	Secondary Schools Girls and Boys (12 up to 18 years)*[1]
LUNCH PATTERN: Meat and/or alternate One of the following or combinations to give equivalent quantities:				
Meat, poultry, fish....	1-1/2 ounces	2 ounces	2 ounces	3 ounces
Cheese................	1-1/2 ounces	2 ounces	2 ounces	3 ounces
Egg[2]	1	1	1	1
Cooked dry beans and peas..............	1/4 cup	1/3 cup	1/2 cup	3/4 to 1-1/4 cups
Peanut Butter..........	2 tablespoons	3 tablespoons	4 tablespoons	4 to 5 tablespoons
Vegetable and/or fruit[3]	1/2 cup	3/4 cup	3/4 cup	1 to 1-1/2 cups
Bread[4]	1/2 slice	1 slice	1 slice	1 to 3 slices
Butter or Fortified Margarine............	1/2 teaspoon	1 teaspoon	1 teaspoon	1 to 2 teaspoons
Milk..................	3/4 cup[5]	1/2 pint	1/2 pint	1/2 pint

[1]When a range in amounts is given, the smaller amounts are suggested for girls and the larger amounts for older boys. An amount midway between the amounts shown is suggested for younger boys.
[2]When egg is served as the main dish in the lunch, use in addition a half portion of meat or other meat alternate for all children except those three up to six years.
[3]Must include at least two kinds.
[4]Or a serving of cornbread, biscuits, rolls, muffins, etc., made of whole-grain or enriched meal or flour.
[5]If this is impractical, serve 1/2 pint.
*Note: These portion sizes also serve as a guide for the amounts of foods to serve older boys and girls (12 and over) in the Special Food Service Program.

DEPARTMENT OF EDUCATION
DIVISION OF DEVELOPMENT AND OPERATIONS
OFFICE OF SCHOOL FOOD SERVICES

PORTION CONTROL CHART

PLEASE SAVE FOR REFERENCE

MEATBALLS	2 LARGE OR 5 SMALL - 4 REG.
MEAT PATTIES	1
FRANKFURT	1
FISH STICKS	3
FISH PORTION	1
CHICKEN, TURKEY, MEAT WITH GRAVY	1 #10 SCOOP
POTATO - WHIPPED	1 #12 SCOOP
POTATO - OVEN BROWN	1 SOLID SPOON
POTATO - PARSLEY	1 SOLID SPOON
RAVIOLI	5 PILLOWS
NOODLEBURG	2 LG. ROUNDED SPOONS - 2 CUPS
MACARONI	2 LG. ROUNDED SPOONS - 2 CUPS
SPAGHETTI	2 LG. ROUNDED SPOONS - 2 CUPS
COLE SLAW (FOR 10# NEED 6 C. DRESSING)	1 SLOTTED SPOON
TOSSED SALAD (FOR 6# NEED $2\frac{1}{2}$ C. DRESSING)	1 SLOTTED SPOON OR TONGS
TUNA FISH SALAD	1 #16 SCOOP
PINEAPPLE - SLICED	1 LG. OR $1\frac{1}{2}$ SMALL
PEACHES - $\frac{1}{2}$'s	1 LG. OR $1\frac{1}{2}$ SMALL
PEARS - $\frac{1}{2}$'s	1 LG. OR $1\frac{1}{2}$ SMALL
FRUIT COCKTAIL	1 LG. SPOON
PEACHES - SLICED	1 LG. SPOON
JELLO	1 #10 SCOOP
TOPPING	1 PLASTIC SPOON

APPENDIX E

DISTRIBUTION OF TOTAL NUMBER OF MEALS AMONG THE SIX SCHOOLS

DISTRIBUTION OF TOTAL NUMBER OF MEALS AMONG THE SIX SCHOOLS

Type of Schools		Number	Percent
Public	1	665	33.8
	2	521	26.5
	3	211	10.7
Non-Public	4	218	11.1
	5	223	11.4
	6	127	6.5
Total		1,965	100.0

APPENDIX F

PARTICIPATION IN THE NATIONAL SCHOOL LUNCH PROGRAM

BY CENTRAL FALLS SCHOOLS

PARTICIPATION IN NATIONAL SCHOOL LUNCH PROGRAM
BY CENTRAL FALLS SCHOOLS[1]

	Total Enrollment	Average Attendence	Participation
1973--1974	2450	2214	804
1974--1975	2450	2215	804
1975--1976	2681	2413	1483
1976--1977	2646	2381	1562
1977--1978[2]	2694	2424	1585

[1] Maureen G. O'Connell, Planner, Dietary Services, Food Service Division, Department of Education, Hayes Street, Roger Williams Building, Providence, RI 02908.

[2] As of October 1977.

PARTICIPATION IN NATIONAL SCHOOL LUNCH PROGRAM

BY CENTRAL FALLS SCHOOLS STUDIED[1]

	Free	Reduced-Price	Paid-In-Full	Total
1976--1977				
Risk	91	26	15	132
Cowden	--	--	--	--
Washington	288	37	27	352
1975--1976				
Risk	182	24	24	230
Cowden	138	23	17	178
Washington	--	--	--	--
1974--1975				
Risk	131	10	9	150
Cowden	91	11	5	107
Washington	--	--	--	--
1973--1974				
Risk	101	7	6	114
Cowden	64	3	2	69
Washington	83	4	9	96

[1] Maureen G. O'Connell, Planner, Dietary Services, Food Service Division, Department of Education, Hayes Street, Roger Williams Building, Providence, RI 02908.

PARTICIPATION IN THE NATIONAL SCHOOL LUNCH PROGRAM DURING

THE HOT AND COLD SCHOOL LUNCH PHASES OF THE STUDY

	Cold School Lunches[1]			Hot School Lunches[2]	
Days of the Week	School 1	School 2	School 3	School 1	School 2
Monday	48	18	21	46	66
Tuesday	37	18	27	57	66
Wednesday	41	16	24	61	64
Thursday	32	13	16	58	55
Friday	37	10	13	54	59
Average For The Week	39	15	20	55	62

[1]Available to a total of 188 sixth-grade students enrolled in the three schools.

[2]Available to a total of 183 sixth-grade students enrolled in the two schools.

APPENDIX G

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF

MALES AND FEMALES IN INDIVIDUAL SCHOOLS

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES AND FEMALES IN SCHOOL I

Energy And Nutrients	Males n=87 Mean Intake	RDA %	Below 1/3 RDA %	Females n=64 Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	663 ± 212[1]	23	89	627 ± 189[1]	25	78
Protein, gm.	23.5 ± 9.3	52	16	21.7 ± 7.3	48	17
Fat, gm.	31.3 ±13.3	--	--	29.4 ±12.9	--	--
Carbohydrates, gm.	73.6 ±20.8	--	--	70.8 ±22.9	--	--
Fiber, gm.	1.2 ± 0.6	--	--	1.2 ± 0.6	--	--
Calcium, mg.	345 ± 135	28	74	316 ± 112	25	85
Phosphorous, mg.	415 ± 152	34	40	381 ± 117	31	56
Iron, mg.	3.3 ± 1.4	17	94	3.1 ± 1.1	16	100
Sodium, mg.	1147 ± 553	--	--	1041 ± 466	--	--
Potassium, mg.	830 ± 298	--	--	797 ± 281	--	--
Vitamin A, IU	1587 ±1734	31	70	1388 ±1427	34	70
Thiamin, mg.	0.41 ±0.18	28	64	0.39 ±0.14	31	62
Riboflavin, gm.	0.64 ±0.24	42	26	0.58 ±0.18	44	18
Niacin, mg.	4.1 ± 1.9	22	87	3.8 ± 1.6	23	81
Ascorbic Acid, mg.	20.5 ±18.1	45	49	24.1 ±23.8	53	46
Sat. Fatty Acid, gm.	11.7 ± 5.1	--	--	10.9 ± 4.5	--	--
Unsat. Oleic Acid, gm.	11.7 ± 5.0	--	--	11.1 ± 4.8	--	--
Unsat. Linoleic Acid, gm.	4.1 ±2.72	--	--	4.0 ± 3.0	--	--
Cholesterol, mg.	80.9 ±34.0	--	--	75.6 ±29.4	--	--

[1]Standard deviation.

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF
MALES AND FEMALES IN SCHOOL 2

Energy And Nutrients	Males n=69 Mean Intake	Males n=69 RDA %	Males n=69 Below 1/3 RDA %	Females n=57 Mean Intake	Females n=57 RDA %	Females n=57 Below 1/3 RDA %
Food Energy, kcal.	668 ± 139[1]	23	97	582 ± 191[1]	23	96
Protein, gm.	27.3 ± 9.0	61	[illegible]8	22.4 ± 8.2	50	14
Fat, gm.	31.7 ± 8.6	--	--	28.1 ±10.0	--	--
Carbohydrates, gm.	70.0 ± 15.6	--	--	61.3 ±21.5	--	--
Fiber, gm.	1.1 ± 0.4	--	--	0.8 ± 0.4	--	--
Calcium, mg.	347 ± 134	28	72	319 ± 137	26	84
Phosphorous, mg.	452 ± 146	37	27	386 ± 141	31	47
Iron, mg.	3.2 ± 1.0	17	98	2.6 ± 0.9	13	100
Sodium, mg.	903 ± 280	--	--	761 ± 313	--	--
Potassium, mg.	886 ± 287	--	--	744 ± 264	--	--
Vitamin A, IU	1225 ± 1011	23	75	891 ±1176	21	91
Thiamin, mg.	0.37 ± 0.11	26	76	0.30 ±0.10	24	82
Riboflavin, mg.	0.62 ± 0.22	40	18	0.56 ±0.21	42	19
Niacin, mg.	4.3 ± 1.2	23	91	3.7 ± 1.3	22	92
Ascorbic Acid, mg.	20.2 ± 16.8	44	43	13.4 ±12.2	29	71
Sat. Fatty Acid, gm.	11.4 ± 3.3	--	--	10.2 ± 3.8	--	--
Unsat. Oleic Acid, gm.	11.2 ± 2.8	--	--	10.2 ± 4.3	--	--
Unsat. Linoleic Acid, gm.	4.7 ± 2.4	--	--	3.9 ± 1.8	--	--
Cholesterol, mg.	102.5 ±116.2	--	--	79.4 ±37.7	--	--

[1] Standard deviation.

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF MALES AND FEMALES IN SCHOOL 3

	Males n=27			Females n=24		
Energy And Nutrients	Mean Intake	RDA %	Below 1/3 RDA %	Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	693 ± 223[1]	24	88	617 ± 192[1]	25	79
Protein, gm.	21.6 ± 7.4	48	22	20.0 ± 6.7	44	16
Fat, gm.	30.4 ±11.4	--	--	26.8 ±10.4	--	--
Carbohydrates, gm.	86.1 ±31.8	--	--	76.7 ±25.0	--	--
Fiber, gm.	1.1 ± 0.6	--	--	1.0 ± 0.5	--	--
Calcium, mg.	304 ± 164	24	77	282 ± 138	22	83
Phosphorous, mg.	371 ± 149	30	59	356 ± 122	29	79
Iron, mg.	3.2 ± 1.1	17	96	2.8 ± 1.2	15	100
Sodium, mg.	947 ± 375	--	--	872 ± 460	--	--
Potassium, mg.	750 ± 284	--	--	614 ± 147	--	--
Vitamin A, IU	589 ± 307	11	100	502 ± 202	12	100
Thiamin, mg.	0.37 ±0.12	25	81	0.35 ±0.13	26	75
Riboflavin, mg.	0.54 ±0.23	35	37	0.47 ±0.15	35	37
Niacin, mg.	4.3 ± 1.8	23	88	3.6 ± 1.8	21	83
Ascorbic Acid, mg.	32.2 ±28.8	70	37	16.4 ±17.4	36	66
Sat. Fatty Acid, gm.	10.9 ± 4.0	--	--	9.7 ± 3.5	--	--
Unsat. Oleic Acid, gm.	11.2 ± 4.0	--	--	9.6 ± 3.7	--	--
Unsat. Linoleic Acid, gm.	4.4 ± 3.7	--	--	4.1 ± 3.9	--	--
Cholesterol, mg.	76.0 ±30.0	--	--	78.9 ±35.8	--	--

[1] Standard deviation.

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF
MALES AND FEMALES IN SCHOOL 4

Energy And Nutrients	Males n=20 Mean Intake	Males n=20 RDA %	Males n=20 Below 1/3 RDA %	Females n=27 Mean Intake	Females n=27 RDA %	Females n=27 Below 1/3 RDA %
Food Energy, kcal.	756 ± 160[1]	26	80	692 ± 154[1]	28	66
Protein, gm.	26.6 ± 8.0	59	5	21.4 ± 6.1	48	11
Fat, gm.	35.6 ±11.9	--	--	31.3 ± 8.5	--	--
Carbohydrates, gm.	84.5 ±21.8	--	--	83.6 ±24.2	--	--
Fiber, gm.	0.8 ± 0.4	--	--	0.9 ± 0.5	--	--
Calcium, mg.	331 ± 189	27	75	274 ± 140	22	88
Phosphorous, mg.	434 ± 155	35	45	371 ± 131	30	62
Iron, mg.	3.6 ± 1.0	19	100	3.6 ± 1.1	19	96
Sodium, mg.	1229 ± 433	--	--	1120 ± 273	--	--
Potassium, mg.	787 ± 285	--	--	683 ± 181	--	--
Vitamin A, IU	927 ± 926	18	90	866 ± 741	21	81
Thiamin, mg.	0.36 ±0.11	25	75	0.36 ±0.13	29	70
Riboflavin, mg.	0.61 ±0.28	40	30	0.52 ±0.21	39	37
Niacin, mg.	5.2 ± 2.1	28	70	4.5 ± 1.8	27	77
Ascorbic Acid, mg.	15.9 ±18.0	34	65	17.6 ±16.7	38	62
Sat. Fatty Acid, gm.	13.5 ± 6.2	--	--	11.3 ± 3.7	--	--
Unsat. Oleic Acid, gm.	13.4 ± 4.4	--	--	11.2 ± 3.2	--	--
Unsat. Linoleic Acid, gm.	4.8 ± 2.4	--	--	4.9 ± 2.6	--	--
Cholesterol, mg.	105 ±60.8	--	--	82.4 ±41.4	--	--

[1]Standard deviation.

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF
MALES AND FEMALES IN SCHOOL 5

Energy And Nutrients	Males n=29 Mean Intake	Males RDA %	Males Below 1/3 RDA %	Females n=19 Mean Intake	Females RDA %	Females Below 1/3 RDA %
Food Energy, kcal.	768 ± 216[1]	26	75	605 ± 182[1]	24	84
Protein, gm.	26.2 ± 9.8	59	10	19.8 ± 8.0	44	31
Fat, gm.	32.2 ±12.1	--	--	26.7 ±11.2	--	--
Carbohydrates, gm.	95.2 ±26.5	--	--	73.2 ±21.0	--	--
Fiber, gm.	0.7 ± 0.5	--	--	0.6 ± 0.3	--	--
Calcium, mg.	346 ± 227	28	68	250 ± 167	20	84
Phosphorous, mg.	440 ± 205	36	48	331 ± 154	27	63
Iron, mg.	3.6 ± 1.1	19	96	3.1 ± 1.2	16	94
Sodium, mg.	1172 ± 510	--	--	932 ± 304	--	--
Potassium, mg.	732 ± 357	--	--	674 ± 256	--	--
Vitamin A, IU	787 ± 721	15	93	682 ± 444	16	89
Thiamin, mg.	0.36 ±0.12	25	82	0.33 ±0.12	27	73
Riboflavin, mg.	0.61 ±0.34	40	41	0.47 ±0.26	35	47
Niacin, mg.	4.9 ± 2.2	26	79	3.9 ± 1.5	24	84
Ascorbic Acid, mg.	14.3 ±22.8	31	68	40.6 ±51.5	89	47
Sat. Fatty Acid, gm.	12.4 ± 6.0	--	--	10.5 ± 5.2	--	--
Unsat. Oleic Acid, gm.	11.9 ± 4.6	--	--	10.1 ± 4.2	--	--
Unsat. Linoleic Acid, gm.	3.6 ± 1.9	--	--	3.1 ± 2.0	--	--
Cholesterol, mg.	111 ±56.4	--	--	80.2 ±48.3	--	--

[1]Standard deviation.

AVERAGE NUTRIENT INTAKE AND PERCENT RDA OF
MALES AND FEMALES IN SCHOOL 6

Energy And Nutrients	Males n=12 Mean Intake	RDA %	Below 1/3 RDA %	Females n=16 Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	629 ± 212[1]	22	91	610 ± 236[1]	25	87
Protein, gm.	24.9 ± 8.0	56	8	22.2 ± 8.8	49	12
Fat, gm.	27.9 ±10.2	--	--	26.7 ± 14.6	--	--
Carbohydrates, gm.	70.4 ±28.9	--	--	71.6 ± 23.6	--	--
Fiber, gm.	0.5 ± 0.3	--	--	0.7 ± 0.4	--	--
Calcium, mg.	332 ± 224	27	66	237 ± 175	19	81
Phosphorous, mg.	423 ± 191	34	41	342 ± 189	27	75
Iron, mg.	3.1 ± 1.0	16	100	3.4 ± 1.0	18	100
Sodium, mg.	1186 ± 437	--	--	1098 ± 317	--	--
Potassium, mg.	634 ± 273	--	--	692 ± 317	--	--
Vitamin A, IU	972 ± 693	18	66	999 ± 749	24	68
Thiamin, mg.	0.28 ±0.08	19	100	0.36 ± 0.14	29	56
Ribovlavin, mg.	0.55 ±0.28	36	41	0.46 ± 0.27	35	62
Niacin, mg.	5.0 ± 2.3	27	58	4.2 ± 1.4	25	68
Ascorbic Acid, mg.	19.4 ±19.8	42	50	36.2 ± 31.8	79	18
Sat. Fatty Acid, gm.	11.6 ± 6.2	--	--	10.4 ± 6.7	--	--
Unsat. Oleic Acid, gm.	10.0 ± 3.4	--	--	9.6 ± 5.5	--	--
Unsat. Linoleic Acid, gm.	2.9 ± 1.9	--	--	3.3 ± 2.6	--	--
Cholesterol, mg.	97.1 ±68.9	--	--	111.7 ±111.9	--	--

[1] Standard deviation.

APPENDIX H

AVERAGE NUTRIENT INTAKE FROM HOT SCHOOL LUNCHES AND PERCENT RDA

OF MALES AND FEMALES IN INDIVIDUAL SCHOOLS

AVERAGE NUTRIENT INTAKE FROM HOT SCHOOL LUNCHES AND PERCENT RDA OF MALES AND FEMALES IN SCHOOL 1

Energy And Nutrients	Males n=40 Mean Intake	Males RDA %	Males Below 1/3 RDA %	Females n=31 Mean Intake	Females RDA %	Females Below 1/3 RDA %
Food Energy, kcal.	743 ± 188[1]	25	87	695 ± 170[1]	28	74
Protein, gm.	26.9 ± 8.6	60	5	25.1 ± 6.7	56	3
Fat, gm.	38.7 ±11.4	--	--	37.3 ±12.4	--	--
Carbohydrates, gm.	73.4 ±18.1	--	--	66.3 ±13.4	--	--
Fiber, gm.	1.4 ± 0.5	--	--	1.4 ± 0.5	--	--
Calcium, mg.	356 ± 90	29	82	326 ± 91	26	93
Phosphorous, mg.	463 ± 126	38	25	429 ± 101	35	38
Iron, mg.	3.8 ± 1.3	20	92	3.6 ± 1.0	19	100
Sodium, mg.	1363 ± 459	--	--	1268 ± 487	--	--
Potassium, mg.	1001 ± 264	--	--	945 ± 231	--	--
Vitamin A, IU	2814 ±1922	55	35	2307 ±1589	57	38
Thiamin, mg.	0.48 ±0.18	33	42	0.44 ±0.16	36	48
Riboflavin, mg.	0.72 ±0.20	47	10	0.66 ±0.14	50	6
Niacin, mg.	4.6 ± 1.7	25	85	4.3 ± 1.3	26	74
Ascorbic Acid, mg.	15.6 ± 7.4	34	57	14.5 ± 6.3	31	58
Sat. Fatty Acid, gm.	14.7 ± 4.0	--	--	14.0 ± 4.0	--	--
Unsat. Oleic Acid, gm.	14.3 ± 4.4	--	--	13.6 ± 4.9	--	--
Unsat. Linoleic Acid, gm.	5.8 ± 2.1	--	--	5.9 ± 3.0	--	--
Cholesterol, mg.	96.4 ±29.1	--	--	91.6 ±26.9	--	--

[1] Standard deviation.

AVERAGE NUTRIENT INTAKE FROM HOT SCHOOL LUNCHES AND PERCENT RDA OF MALES AND FEMALES IN SCHOOL 2

Energy And Nutrients	Males n=47 Mean Intake	Males RDA %	Males Below 1/3 RDA %	Females n=34 Mean Intake	Females RDA %	Females Below 1/3 RDA %
Food Energy, kcal.	694 ± 122[1]	24	95	600 ± 125[1]	24	97
Protein, gm.	30.6 ± 6.8	69	2	25.2 ± 7.1	56	2
Fat, gm.	34.4 ± 6.4	--	--	29.8 ± 6.5	--	--
Carbohydrates, gm.	66.8 ±12.4	--	--	58.9 ±13.6	--	--
Fiber, gm.	1.1 ± 0.4	--	--	0.8 ± 0.3	--	--
Calcium, mg.	376 ± 114	30	74	319 ± 98	26	91
Phosphorous, mg.	500 ± 111	41	12	413 ± 114	33	32
Iron, mg.	3.2 ± 0.7	17	100	2.7 ± 0.7	14	100
Sodium, mg.	873 ± 211	--	--	753 ± 219	--	--
Potassium, mg.	1016 ± 203	--	--	838 ± 205	--	--
Vitamin A, IU	1513 ±1057	29	65	1147 ±1463	28	85
Thiamin, mg.	0.38 ±0.10	26	74	0.32 ±0.08	25	82
Riboflavin, mg.	0.67 ±0.17	44	36	0.57 ±0.16	43	11
Niacin, mg.	4.6 ± 1.0	25	89	3.9 ± 1.0	23	97
Ascorbic Acid, mg.	16.9 ± 9.3	36	46	11.4 ± 4.2	24	76
Sat. Fatty Acid, gm.	12.5 ± 2.6	--	--	11.0 ± 2.6	--	--
Unsat. Oleic Acid, gm.	11.7 ± 2.3	--	--	10.3 ± 2.3	--	--
Unsat. Linoleic Acid, gm.	5.3 ± 1.9	--	--	4.5 ± 1.6	--	--
Cholesterol, mg.	99.0 ±21.2	--	--	82.4 ±22.8	--	--

[1] Standard deviation.

APPENDIX I

AVERAGE NUTRIENT INTAKE FROM COLD SCHOOL LUNCHES AND PERCENT RDA

OF MALES AND FEMALES IN INDIVIDUAL SCHOOLS

AVERAGE NUTRIENT INTAKE FROM COLD SCHOOL LUNCHES AND PERCENT RDA OF MALES AND FEMALES IN SCHOOL 1

Energy And Nutrients	Males n=31 Mean Intake	Males RDA %	Males Below 1/3 RDA %	Females n=24 Mean Intake	Females RDA %	Females Below 1/3 RDA %
Food Energy, kcal.	611 ± 198[1]	21	90	557 ± 174[1]	22	87
Protein, gm.	21.8 ± 7.9	49	16	17.9 ± 5.2	40	25
Fat, gm.	25.0 ± 9.5	--	--	21.4 ± 7.6	--	--
Carbohydrates, gm.	76.8 ±23.8	--	--	75.5 ±26.9	--	--
Fiber, gm.	1.2 ± 0.6	--	--	1.1 ± 0.7	--	--
Calcium, mg.	380 ± 118	31	58	347 ± 102	28	70
Phosphorous, mg.	405 ± 119	33	45	352 ± 96	28	66
Iron, mg.	2.8 ± 1.4	15	93	2.2 ± 0.9	11	100
Sodium, mg.	984 ± 523	--	--	789 ± 297	--	--
Potassium, mg.	729 ± 206	--	--	691 ± 272	--	--
Vitamin A, IU	644 ± 236	12	100	636 ± 194	15	100
Thiamin, mg.	0.35 ±0.16	24	83	0.30 ±0.12	24	83
Riboflavin, mg.	0.62 ±0.19	40	32	0.54 ±0.16	41	16
Niacin, mg.	3.7 ± 1.9	20	90	2.7 ± 1.3	16	91
Ascorbic Acid, mg.	26.7 ±22.2	58	41	36.6 ±33.2	80	41
Sat. Fatty Acid, gm.	9.3 ± 3.4	--	--	8.0 ± 2.8	--	--
Unsat. Oleic Acid, gm.	9.8 ± 3.9	--	--	8.2 ± 3.0	--	--
Unsat. Linoleic Acid, gm.	2.0 ± 1.6	--	--	1.5 ± 1.5	--	--
Cholesterol, mg.	67.3 ±24.9	--	--	58.4 ±18.5	--	--

[1] Standard deviation.

AVERAGE NUTRIENT INTAKE FROM COLD SCHOOL LUNCHES AND PERCENT RDA OF MALES AND FEMALES IN SCHOOL 2

Energy And Nutrients	Males n=11 Mean Intake	Males RDA %	Males Below 1/3 RDA %	Females n=11 Mean Intake	Females RDA %	Females Below 1/3 RDA %
Food Energy, kcal.	671 ± 126[1]	23	90	535 ± 183[1]	21	100
Protein, gm.	23.6 ± 6.0	53	0	18.4 ± 6.8	41	27
Fat, gm.	27.5 ± 7.5	--	--	22.3 ± 8.9	--	--
Carbohydrates, gm.	84.6 ±15.3	--	--	67.2 ±22.4	--	--
Fiber, gm.	1.1 ± 0.6	--	--	0.9 ± 0.5	--	--
Calcium, mg.	422 ± 62	34	36	306 ± 85	25	72
Phosphorous, mg.	441 ± 80	36	36	333 ± 97	27	72
Iron, mg.	3.0 ± 1.2	16	100	2.3 ± 1.1	12	100
Sodium, mg.	1068 ± 456	--	--	789 ± 436	--	--
Potassium, mg.	797 ± 192	--	--	631 ± 212	--	--
Vitamin A, IU	734 ± 207	14	100	513 ± 183	12	100
Thiamin, mg.	0.40 ±0.16	28	72	0.30 ±0.12	24	72
Riboflavin, mg.	0.70 ±0.12	45	0	0.51 ±0.13	38	27
Niacin, mg.	3.8 ± 1.3	20	100	3.5 ± 1.9	21	81
Ascorbic Acid, mg.	35.1 ±24.3	77	36	27.3 ±21.4	59	36
Sat. Fatty Acid, gm.	10.6 ± 3.0	--	--	8.2 ± 2.9	--	--
Unsat. Oleic Acid, gm.	10.7 ± 3.1	--	--	8.6 ± 3.5	--	--
Unsat. Linoleic Acid, gm.	1.8 ± 1.0	--	--	2.1 ± 1.8	--	--
Cholesterol, mg.	88.2 ±43.3	--	--	59.5 ±24.4	--	--

[1]Standard deviation.

AVERAGE NUTRIENT INTAKE FROM COLD SCHOOL LUNCHES AND PERCENT RDA OF MALES AND FEMALES IN SCHOOL 3

Energy And Nutrients	Males n=14 Mean Intake	RDA %	Below 1/3 RDA %	Females n=9 Mean Intake	RDA %	Below 1/3 RDA %
Food Energy, kcal.	613 ± 296[1]	21	85	449 ± 91[1]	18	100
Protein, gm.	20.6 ± 8.9	46	28	15.2 ± 3.6	34	22
Fat, gm.	24.7 ±11.1	--	--	17.4 ± 4.1	--	--
Carbohydrates, gm.	79.8 ±43.8	--	--	60.6 ±11.5	--	--
Fiber, gm.	1.1 ± 0.7	--	--	1.1 ± 0.4	--	--
Calcium, mg.	399 ± 138	32	57	318 ± 74	25	88
Phosphorous, mg.	407 ± 155	33	57	319 ± 61	26	100
Iron, mg.	2.6 ± 1.4	13	92	1.8 ± 0.6	9	100
Sodium, mg.	864 ± 501	--	--	554 ± 240	--	--
Potassium, mg.	790 ± 346	--	--	681 ± 100	--	--
Vitamin A, IU	680 ± 306	13	100	570 ± 155	13	100
Thiamin, mg.	0.34 ±0.15	23	78	0.27 ±0.10	21	88
Riboflavin, mg.	0.63 ±0.24	41	14	0.51 ±0.09	38	11
Niacin, mg.	3.3 ± 1.6	18	92	2.2 ± 0.7	13	100
Ascorbic Acid, mg.	34.1 ±20.3	75	21	23.5 ±15.3	51	44
Sat. Fatty Acid, gm.	9.6 ± 4.2	--	--	7.0 ± 1.6	--	--
Unsat. Oleic Acid, gm.	9.6 ± 4.7	--	--	6.4 ± 1.6	--	--
Unsat. Linoleic Acid, gm.	1.8 ± 1.1	--	--	1.1 ± 1.1	--	--
Cholesterol, mg.	67.2 ±33.1	--	--	51.5 ±14.3	--	--

[1] Standard deviation.