EFFECT OF FAMILY VERSUS CAFETERIA STYLE SCHOOL LUNCH SERVICE ON STUDENTS' ATTITUDES AND FOOD SERVED, WASTED, AND CONSUMED

By

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INTRODUCTION

The National School Lunch Program (NSLP), authorized by the National School Lunch Act of 1946 (1) and operated by the Food and Nutrition Service of the United States Department of Agriculture (USDA/FNS), is the largest of several federally funded child feeding programs. The NSLP objectives are 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 (2). In "The National Evaluation of School Nutrition Programs," a four year study requested by Congress in 1979, the nutritional benefits of the program were investigated (3). The study showed that students participating the the NSLP had higher intakes of food energy and nutrients, except iron and vitamin C, than students who were non-participants.

Budget cuts resulting in higher prices for school lunches are reflected in participation decreases from a 1979 high of 27 million (60.5 percent of eligiblie school enrollment) to a 1982 low of 23.1 million (56.1 percent of eligible school enrollment) children served per day (4). Increases in free and reduced price lunches resulted in a reversal of the four year downturn with a fiscal year 1983 participation level of 23.2 million children served per day (5). Increases in paid lunches in fiscal year 1984 continued the reversal of the downward trend and resulted in a January 1984 level of 23.5 million children served per day (6). In addition to cost, other factors that influence participation of the individual child in the

NSLP include: alternate food choices, food attitudes, meal acceptability, nutrition knowledge, and parental attitudes and knowledge (7).

Innovative lunch programs using variations in serving styles and lunchroom atmosphere have been implemented to decrease plate waste and increase participation and consumption in many school lunch programs. The recent extension of "offer versus serve" to elementary schools allows greater flexibility in serving styles. All five food items included in the lunch pattern must be offered, but students can select as few as three items (8). Portion size variation, self service buffet, and family style service have been used in elementary schools.

In family style food service, students serve themselves from bowls and platters of food passed around the table. Family style meal service has been used at the Theodore Roosevelt Elementary School in Manhattan, Kansas since the fall of 1982 (9). The principal, food service personnel, and the District Food Service Director are enthusiastic about family style meal service. They believed that plate waste was less with family style than with cafeteria style, but no data had been collected to substantiate their belief. They were anxious for a well designed research study to be conducted to compare the effect of family versus cafeteria style school lunch service on students' attitudes, food intakes, food acceptances, and daily nutrient intakes. A two-part study was conducted to make this comparison. In one part of the study, food acceptance and daily nutrient intake of the students were studied. Students' attitudes toward school lunch and food intakes were measured in the other part

of the study. The objectives of this component of the two part study were:

1) to compare the effect of family versus cafeteria style school lunch service on students' attitudes, and

2) to compare the effect of family versus cafeteria style school lunch service on food waste and intake.

Review of Literature

Historical Background

A campaign against vagrancy initiated the first teaching and feeding site for hungry children in Munich, Germany in 1790 (10). French canteens, established in 1849, were the forerunners of the school lunches, which soon became part of the compulsory education law (11). Charitable organizations such as civic clubs, parent-teacher associations, and volunteer fire departments were early sponsors of school programs in the United States and England (11). In 1853, the Children's Aid Society of New York City served free school lunches to children in vocational schools for the poor (12). By 1903, Holland and Switzerland had adopted federal laws which provided food and clothing for needy school children (13, 14).

England's 1906 Provision of Meals Act, which provided school meals for needy children, was enacted because of the number of men found unfit to fight in the 1902 Boer War (11). Educators were also beginning to associate malnutrition and learning problems of needy children. School feeding programs throughout many European nations and United States cities were established before World War I.

The earliest federally assisted programs in the United States were initiated in the 1930's for surplus agricultural product disposal. Loans and surpluses were provided as early as 1932. A direct purchase and distribution of surplus commodities was established by Section 32 of the Agriculture Act of 1935 (15). Cash grants for local purchases of milk and lunch in schools were made by the USDA from 1943 to 1946. The 1944 Agricultural Appropriations Act

authorized a specific amount of Section 32 funds without regard to surpluses (PL 78-129) when farm product excesses diminished.

National School Lunch Program Legislation

Malnutrition among the armed forces affecting national security focused Congressional attention on the importance of good nutrition at the end of World War II. The National School Lunch Act (Public Law 79-396) was enacted in June 1946 by the 79th Congress (1). The law authorized appropriations to fulfill the purposes stated in Section 2 as follows:

> It is hereby declared to be the policy of Congress, as a measure of national security 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 nonprofit school lunch programs (1).

Policies developed for the cash assistance program and written into the permanent legislation stipulated that: (a) the program should be nonprofit with records maintained, (b) lunches served should meet nutritional requirements prescribed by the Secretary of Agriculture, and (c) free or reduced price lunches should be served to children unable to pay the full lunch cost (16). Funds were appropriated to states on a matching basis and according to need based on the number of school children and per capita income. In addition, funds for nonfood assistance and purchase of agricultural commodities were provided.

In 1962 Public Law 87-823 (17) changed the basis of states' apportionment of funds from enrollment to participation rates and per

capita income to provide special assistance to schools in areas where poor economic conditions existed. The Child Nutrition Act of 1966 (PL 89-642) authorized funds to states for supervision and technical assistance, School Breakfast Program, nonfood assistance, equipment assistance and the general assistance program (18).

Public Law 91-248 (19) in 1970 established eligibility guidelines for free and reduced price lunches and prohibited overt identification of children receiving free and reduced price meals. The 1971 and 1972 legislation (92-153, 92-433) determined the per meal reimbursement figure and statutory minimum poverty guidelines (15). PL 93-150 (20) in 1973 adjusted the per meal reimbursement and provided an escalator clause to require the USDA to review food costs semiannually and automatically index the rate to inflation. In 1974, PL 93-326 (21) required the commodity assistance to be adjusted annually for changes in the Consumer Price Index. The law also made permanent the reduced price lunch income guidelines, but the offering of reduced price lunches was optional. Under the 1975 Public Law 94-105 (22), states were required to offer the reduced price lunches. The 1975 act also redefined school to include public or licensed nonprofit, private residential child care institutions such as orphanages and homes for the mentally retarded.

To help decrease food waste, the 1975 act provided that the Type A lunch could be offered rather than served to students in senior high schools. The new regulations specified that students were required to select only three of the five components of the Type A meal. In 1977, PL 95-166 (23) extended the offer versus serve option to include junior high and middle school students when approved by

the local school authority. Funds for nutrition information and education programs were added to the services of children. Adjustments of income eligibility for free lunches were made in 1978 and 1980 (15). Amendments in 1979 (24) eliminated the term "Type A", encouraged student involvement, and changed meat alternate, milk, and bread requirements. The Omnibus Reconciliation Act of 1980 (25) brought reforms of a cost reduction nature. Although the act provided for standard deductions to offset the impact of recent lowered income eligibility criteria, the overall effect was a reduction in eligibility for free and reduced price lunches. The general assistance reimbursement rate and commodity assistance also were reduced. The Omnibus Budget Reconciliation Act of 1981 (Title VIII of Public Law 97-35) (26) further reduced federal spending as part of the Reagan administration's economic recovery package (15). Major changes affecting the school food programs included:

* Reduced payment rates of paid and reduced price lunches and breakfasts but increased free meal rate.
* Reduced rates of commodity entitlements for all lunches.
* Tightened eligibility standards for free and reduced price meals.
* Termination of food service equipment assistance.
* Reduction in nutrition education and training grants.
* Authorization of "offer versus serve" in elementary schools and changes in meal requirements (27).

The cost reduction measures were estimated to save $400 million during fiscal year 1981 and $1.4 billion during fiscal year 1982 (15) while shifting benefits to those with greatest need.

Students' Attitude Toward School Lunch

Many factors affect school lunch participation, plate waste, and students' attitudes. Critical factors affecting school lunch acceptance in 23 elementary schools in Washington, D. C. were studied by Davidson (28). The schools served preplated lunches but differed in environmental organization. Nonfood factors, such as adult supervision, were found to be related to the success of the school lunch program. The researcher suggested that surroundings perceived as unpleasant by students could ruin a program with excellent food quality. Physical and cultural environment and nutrition education were considered critical factors in determining the level of school lunch acceptance and plate waste.

Presentation of food in a positive environment has been shown to increase consumption of food (29). Doucette (30) used a questionnaire to investigate attitudes of Hawaiian high school students toward school lunch. Results showed that schools with new, attractive lunchrooms received above average ratings for their lunches, and staff members in those schools were considered more pleasant. A school with an overcrowded, unattractive lunchroom received a lower than average lunch rating. Most students thought portions were too small, but believed school lunch was nutritious and a bargain. School lunch rating was related inversely to participation, but the researchers suggested that high participation with a closed campus policy may have caused the negative attitudes.

Studies of students' attitudes toward school lunch by Garrett and Vaden (31) and Gargano (32) showed that attitude scores were significantly higher for frequent participants of the school lunch

program. Garrett and Vaden (31) collected data from sixth graders in three elementary schools to study the influence of student-selected menus on elementary student participation, plate waste, and attitudes toward school food service. The manager selected menus were served during the control period. Student selected menus were served in all three schools during the experimental period. Percentage participation was higher when student-selected menus were offered than when menus were manager-planned. The school with the greatest number of free or reduced price meals had the highest percentage participation in both periods. Plate waste decreased significantly in two of the schools with student-planned menus.

The attitude instrument results showed that over 75 percent of the students who ate school lunch liked the food served at school. Friends, parents, and working mothers were strong influences on school lunch participation. Students indicated they brought sack lunches because they disliked school lunch food, preferred sack lunches, and sack lunches were cheaper.

Attitude scores indicated that extensive involvement of students in food service had a positive effect on their attitudes toward school lunch. Students who responded that the cooks were friendly, had significantly higher scores than students who viewed the cooks as crabby.

Gargano (32) used an attitude survey in a study of high school students' intended and actual entree selections. Over half (63.1 percent) of the students who usually ate the school lunch indicated they liked the food served at school. Friends, price, and parents were given as other reasons for eating the school lunch. Most

infrequent participants (69.6 percent) indicated they did not like food served at school. Attitude scores for frequent participants were significantly higher than for those who ate infrequently. Analysis of individual items showed that students responded favorably to appropriate serving size and temperatures of food. Students had more negative attitudes about vegetables than other menu items. Students who were frequent participants had more positive responses to cleanliness and cheerfulness of the lunchroom and cashier friendliness than infrequent participants.

Gutsch (33) conducted a food service attitude survey to determine the influence of offering choices of vegetable menu items on junior high students' attitudes toward school food service. The majority of the students indicated they ate the school lunch five times a week. Frequent participants responded that they ate lunch because their friends did and they liked the food. About half of the infrequent participants reported that they preferred a sack lunch and did not like the school lunch food. Over 40 percent indicated it was cheaper to bring a sack lunch.

There were small but significant decreases in attitude scores when vegetable choices were offered the week before a holiday compared to the usual no vegetable choice at the beginning of a semester. This finding was attributed to the time during the semester when the survey was administered and not to the change in vegetable choices.

The researcher found that frequent participants had a higher opinion of the food served in the school lunch than infrequent participants. Negative student attitudes were associated with

infrequent school lunch participation. Frequent participants rated cook and cashier friendliness and noise level in the lunchroom more positively than infrequent participants.

Attitudes toward school lunch were studied by Head et al. (34, 35) using a Likert type scale. Data from fifth, seventh, and tenth graders showed elementary students had more positive attitudes than secondary students. Attitudes were generally more positive at the beginning than near the end of the school year. Students receiving free lunches generally responded with more favorable attitudes toward school lunch than students who paid full price.

Plate Waste and Food Consumption in NSLP

Food waste in school lunch programs is costly in dollars and cents as well as in loss of nutrients. Lilly et al. (36) stated that a basic objective of the NSLP has been to aid in the formation of good eating habits in the lunchroom; therefore, some food waste in school was inevitable since children are served nutritious foods that may differ from the foods they are accustomed to eating. Many studies assessing plate waste and consumption in the NSLP have been published (36-42). In 1958, a series of plate waste studies were conducted in elementary schools by Carver and Patton (37, 38). The researcher concluded that (a) children in grades one through three ate proportionally less than older children, (b) meats were preferred served plain rather than in mixtures, (c) milk was well liked, and (d) waste was lowest in desserts and highest for vegetables. For individual items, Patton and Carver (38) reported a mean percentage waste of 7.4 percent for meat served alone, 15.8 for meat in combination, 10.4 for protein rich foods, 13.9 for vegetables, and

9.4 for desserts.

In 1968, Doucette (30) reported that students' plate waste, as observed by researchers in five Hawaiian high schools, was higher for girls than for boys. Milk and meat waste was lower than bread or starch; more fruits and vegetables were wasted than any other food groups.

Walling (39) found overall plate waste to be 25.1 percent in all grades in Albuquerque Public Schools. The pattern of food waste was similar to that reported by Doucette. The percentage wastes were: milk, 5.8; meat, 12.7; fruits, 29.4; and vegetables, 52.5. A West Virginia plate waste study (40) showed 12 to 17 percent for milk waste, 67 percent for coleslaw, and 72 percent for broccoli.

Jansen and Harper (41) studied fifth graders in 29 elementary schools and tenth graders in 29 high schools selected by the USDA/FNS in 1978. Plate waste was weighed for 30 to 50 students per school for ten days resulting in data on about 23,000 individual lunches served cafeteria style. The percentage consumption by menu items was as follows: milk, 87.8; meat, 66.7 to 82.6; bread, rolls, cereal, and chips, 77.9; desserts, 61.3 to 93.3 ; salads, 53.1; and vegetables, 35.2 to 55.4. The pattern of food waste was similiar to that reported in other studies (30, 37-40).

Fifth grade students in 80 elementary schools were studied by Lilly et al. (36) to assess nutrient contribution, waste, and consumption of lunches served to and consumed by students participating in on-site and preportioned-delivered food service systems in the NSLP. Milk had the highest percentage consumption (85.8) and vegetables the lowest. Overall, the students consumed

75.3 percent of the food served.

The Comptroller General's report to Congress in 1981 (42) stated that milk waste was lowest and vegetable/fruit waste was highest with an average plate waste of 13 percent in school lunch programs. Factors that the food service officials considered to affect plate waste significantly were: offer versus serve, variety of food offered each day, lunchroom atmosphere, and nutrition education. Factors that officials considered to have minor impact on plate waste included length of lunch period, portion size, and paid or free lunch status.

According to Lilly et al. (36) the USDA has initiated or implemented many activities in an attempt to improve food consumption. The activities include (a) proposing revisions in meal requirements, (b) implementing "offer versus serve" provisions, (c) proposing regulations concerning sale of foods in competition with school lunch, (d) encouraging on-site food preparation, (e) implementing training programs for school food service personnel, and (f) implementing nutrition education programs. They suggest further that school administrators at the local level support the program by (a) involving students in various aspects of the school lunch program, such as menu planning, enhancement of the food service environment, and nutrition education activities; (b) involving parents, faculty, and the community in activities designed to enhance the program; (c) providing sufficient time for students to eat lunch; (d) providing menu choices; (e) planning for adequate supervision of the lunchroom; (f) encouraging teachers to eat with students; and (g) allowing opportunities for in-service training programs.

Food Delivery Systems

Many school districts have been faced with the question of how to remodel existing school food service facilities or establish new ones. Spiraling labor costs in food service and budget restrictions have resulted in development of alternate food service systems. School administrations have sought ways to limit space and equipment requirements and curtail labor costs by centralizing production. In the conventional on-site preparation system, all preparation is completed on the premises where the food is to be served (43). The product flow time is short and distribution costs are minimal. The central kitchen, commissary, or satellite system has centralized purchase and production with prepared food delivered to schools in the area for final preparation and service. Food prepared in the central kitchen may be held in bulk or portioned before storage. Three alternatives for storage and delivery of prepared foods are available: hot-held, chilled, and frozen. The food is delivered by truck to other schools in the area. A satellite serving unit is any school where food is delivered for service (43).

The USDA/FNS contracted for a pilot study of four food delivery systems in 16 selected elementary schools to determine each system's advantages, disadvantages, and suitability for specific schools (44-47). The systems studied were: (a) conventional on-site school food preparation and service, (b) food preparation in a school system's central kitchen followed by hot bulk transport to satellite schools, (c) food preparation in a school system's central kitchen followed by chilled transport of preportioned food to satellite schools (some of

the menu items produced by this system required heating prior to service), and (d) purchase of frozen preportioned meals which were heated to serving temperature in individual schools. The systems were compared with regard to nutritional quality, contamination, cost and acceptability of the food. The researchers weighed plate waste of 50 fifth and sixth grade students, determined weights of standard served portions, and calculated the percentage of food items consumed in each school. Acceptability values (44) paralleled those found in earlier plate waste studies (36-42). Meat consumption varied from 67.8 to 93.3 percent with an 83.2 average; desserts also had high acceptability. Green and yellow vegetables had the lowest percentage consumption, averaging 37.8 percent. Data indicated that on-site preparation and service produced meals with higher acceptability than the central preparation with chilled or frozen preportioned delivery. Appearance, monotony, preparation difficulties, personal factors, flavor, portion size, and meal quality were cited as probable reasons for the differences. Differences in consumption in schools with on-site preparation and central preparation with hot bulk delivery were not significant depending on the delivery system.

Variations in nutrient levels and microbiological quality associated with the four food delivery systems were rarely significant (45, 46). The data indicated that all delivery systems were capable of providing food of comparable nutritonal value and microbiological quality to the serving line. The quality and acceptability varied significantly with food preparation practices of individual schools. The researchers concluded that with all delivery systems, proper attention must be given to all factors known

to affect quality. On-site preparation and central preparation with hot bulk delivery had nearly the same space requirements and costs per meal (47, 48). Although labor costs were higher for on-site and hot bulk delivery, no total meal cost differences were noted among the four delivery systems (48).

Johnson (49) conducted a study of food delivery systems in eight elementary schools. Four were on-site preparation and service schools and four were satellite schools. Five sample trays were selected at random to determine serving sizes. Three methods were used to determine entree and vegetable plate waste: self report by students, visual estimation by observers, and weight. Students' rating of food, holding times, and temperatures were recorded. The percentage of students eating lunch every day was larger in on-site schools than satellite schools. More students in on-site schools (40 percent) thought the food was almost always good compared to students in satellite schools (16 percent). Satellite systems had longer food holding times, which often resulted in temperatures below 140° F and decreased food quality as indicated by students' acceptability ratings on flavor, color, and temperature. Waste of vegetables tended to be somewhat higher in satellite than on-site schools. Over 30 percent of the students in on-site schools had no vegetable plate waste compared to 24.2 percent in satellite schools. The distribution of percentage entree waste, regardless of method of determination, was similar for on-site and satellite schools. Mean percent plate waste by weighing was 25.8 percent for all entrees and 69.3 percent for all vegetables. Vegetable waste decreased as acceptability ratings for flavor and appearance increased. High

plate waste was associated with students' perceptions of too cool temperatures of hot foods and too large portion sizes. Lower plate waste was correlated with positive student hedonic ratings

The effect of delivery system on the nutritive value of entrees and vegetables was examined by Prusa et al. (50). Food items were sampled from central, on-site, and satellite kitchens. The study showed no differences among schools for ascorbic acid, thiamin, and vitamin B_6 contents of entrees. Vitamin B_6 values were lower in peas served at the satellite school than in the central kitchen or on-site school. The vitamin B_6 content was lower in broccoli served at the central kitchen and satellite schools compared to the on-site school. Loss of ascorbic acid at the satellite school was considerable, particularly from broccoli. The researcher stated that when possible, on-site preparation of frozen vegetables should be considered.

Serving Styles

Several reports have appeared in the literature describing innovative elementary school lunch programs, but few quantitative studies have been conducted. The effect on plate waste and participation were mentioned, but the method of assessment and statistically analyzed data usually were not reported.

Self serve buffet was found to reduce plate waste in Valparaiso, Indiana elementary schools (51). First and second grade students were assisted and third through sixth grade students served themselves from dual buffet lines. Students were required to take at least a three bite portion and were limited to one normal portion the first time through the line. If students ate all their food they

were allowed to go back for seconds. The fifth grade students in one school conducted plate waste studies and found that waste was almost non-existent.

Schools in Memphis, Tennessee (52) used offer versus serve throughout the system with students selecting at least three of the five foods offered. Menu choices were offered and salad bars were available. One elementary school included self serve. Nutrition education was part of their curriculum. The system's food costs, which were expected to rise ten percent for the year, were reported at one percent. The savings was attributed to offer versus serve.

Self-service has been operating in 13 elementary schools in Danville, Illinois (53). Entrees were served by staff, but buffet tables with a variety of items allowed 85 students to be served in ten minutes. Students were required to take an entree, two servings of vegetables and/or fruits, bread, and beverage. Staff members reported that children were eating more food and wasting less. Food waste of 100 students was reduced from two gallons to two to three cups. Participation increased to 90 percent despite worsened local financial conditions.

Two elementary schools in Florida (54) used preportioned protein items plus self serve vegetable and fruit selections on a salad bar. The new food service was introduced in ten minute nutrition education and menu announcement periods in the classroom. Principals were enthusiastic about the changes and more schools were targeted for added salad bar programs.

In 1973, Montoya (55) reported that family style service had met with considerable success in six Beaverton, Oregon elementary

schools. Rotating hosts or hostesses set tables for six to eight classmates, served hot food from steam tables using platters and bowls, served seconds, and cleared tables. Minimal food waste and greater amounts of food consumed were reported, but the methods used to determine food intake were not stated nor were data presented. A more recent report (56) indicated that 12 of 27 elementary schools were serving family style. The school food supervisor reported more time to eat, less noise, and more pleasant atmosphere with family style service.

A Houston, Texas elementary school experiment with family style service has been successful (56). The food service director reported improved manners, more time to eat, diminished plate waste, and increased student satisfaction.

Contracts with elementary school principals and teachers in Tucson, Arizona established a program of classroom education and family style dining (56). Commitment of staff to the program was reported to have had multiple benefits including elimination of plate waste. With the emphasis on education, the director of food service reported the requirements for meal pattern compliance were being met.

Strum and Watts (57) reported that two school lunch programs succeeded in reducing plate waste by serving meals family style. At a Pennsylvanina elementary school, staff set tables and served bowls of food from carts to tables seating four to 16 students. Students were encouraged to take only as much as they could eat. Two Denver schools used family style meal service occasionally to improve student habits and reduce plate waste. Students were taught to serve themselves the Type A lunches to meet NSLP requirements but were encouraged to take

only amounts they could eat. Rotating hosts or hostesses set tables, served bowls of food, cleared tables and scraped dishes. Families competed to have the best record of plate waste. Students' understanding of nutrition and foods necessary for good health were reported to have improved. Reduced plate waste was reported at the schools but the determination methods and data were not presented. No reference was made to measurement of food remaining in serving dishes or "bowl waste".

In the 1975-76 school year, a Denver elementary school served lunches family style for third, fourth, and fifth graders at least once a week (58). Students discussed the menu and the food groups in the nutrition lessons in the classroom. Servers set tables with placemats, name tags, napkins, and napkin rings made in art class. Students had to taste everything and eat all the food they served themselves. Guests were invited frequently and improvement in table manners was noticed by parents. Comparison of family style and cafeteria style food waste, expressed as percentages of served, were reported as follows: barbequed beef on a bun, 2.7 (family style) and 10.6 (cafeteria style); green beans, 5.9 and 12.5; coleslaw, 9.7 and 24.0; and peanut butter cookie, 0 and 7.7. Average waste reported for family style was 4.0 percent compared to 7.2 percent waste in cafeteria style food service. No methods of data collection or statistical analysis were indicated.

Family style service was implemented in one elementary school as a pilot study in a New Jersey school district with funds provided by a Nutrition Education and Training Program grant (59). Plate waste in the district's frozen preplate system was compared to the new

family style service using the same menu. Neither plate waste measurement methods nor data were reported. Staff reported positive effects on behavior and attitudes on the children.

Heimberg (60) analyzed the effects of serving style on food waste of 12 classes of third, fourth, and fifth grade Florida elementary school lunch participants. The factors affecting meal acceptability were assessed by comparing standard service with "portion size", which allowed children to request variations in the amount of food received, "self serve" from a buffet table, and "family style" with group portions served in bowls and platters at tables with table cloths. Serving styles were compared with respect to food waste, food consumption and student preference. Each serving style was used by all classes during the 17-day study. In general, self-serve and family style were equally effective and both were shown to be superior to standard service in reducing vegetable waste. Students preferred self-serve and family style over portion size and standard service.

METHODOLOGY

Study Sites

The study was conducted at three elementary schools in one district in a medium-sized midwestern city. The elementary school lunch programs served grades one through six. The school food service director was responsible for district level school lunch administration. Non-cyclical menus were planned centrally one month in advance for service in all on-site and base kitchen food preparation schools.

The schools selected included one family style school lunch service established in the fall of 1982, Theodore Roosevelt, and two schools with cafeteria style food service, Woodrow Wilson and Lee. One cafeteria style food service and the family style food service used a satellite delivery system in which food was received from the senior high school base kitchen. The other school with cafeteria style food service had on-site school food preparation. The schools were similar in student enrollment, lunchroom facilities, and attitudes of the school staff toward the school lunch program.

In the family style food service at Theodore Roosevelt School, students were served during two, 30 minute periods. Two fifth or sixth grade hosts at each table submitted the orders for milk and lunches to the food service personnel in the kitchen. Food was served from the kitchen in bowls, platters, and plates according to the number of students at the table. The hosts delivered the containers of food to their tables on trays and assisted in serving participating students. Any remaining food items were offered to

students by supervisors before removal from the table. Eight to 12 students of various grade levels were assigned to each of fifteen tables. Silver, napkins, and plates were picked up by students upon entering the lunchroom. The four supervisors passed leftovers from table to table and delivered removed food containers to the kitchen dish return. After students finished eating they took their plates to the dish return and hosts cleaned the tables. Students assembled by grade and were excused to return to the classroom.

Woodrow Wilson School with satellite food delivery and Lee School with on-site food preparation both served cafeteria style by classes at predesignated intervals. Students were allowed about 25 minutes to eat lunch. Food was served by food service personnel on rectangular compartmentalized trays with quantity adjustment on some items according to grade level. No seconds were served. Students lined up to pick up the served trays and were seated at rectangular tables with side seating. Seating areas were designated at Lee School. Students were excused by table to take their trays to the dish return and were accompanied by their supervisor to the playground. Students at Woodrow Wilson selected their seating positions, took trays to the dish return after eating, and proceeded to the playground. Table cleanup was completed by food service personnel in both cafeteria schools.

Approval and Consent

The research proposal was approved by the school district superintendent and the University Subcommittees on Research Involving Human Subjects in the Colleges of Home Economics and Education

(Appendix A). School principals' approvals of the study were obtained by the district food service director.

Introductory letters (Appendix B) were sent to the principals and subsequent planning meetings were held, which included the researchers, principals, and the district food service director. Plans for the study were discussed with the school food service managers and other necessary school personnel. Information packets (parent and student letter and consent forms, School Lunch Questionnaire, and narrative instructions for the questionnaire and lunchroom data collection) and letters (Appendix B) describing the teachers' role in the project were formulated by the researchers and distributed by the principals.

A parent and student letter describing the project with participation consent forms attached (Appendix A) were distributed in duplicate and completed forms were collected by classroom teachers. Rosters of participating students were developed from the consent forms. Four digit identification numbers were assigned to each participating student. The first two digits indicated the school and grade level and the last two identified the class and individual student.

School Lunch Questionnaire

Development of Instrument. A number of school lunch questionnaires were reviewed prior to the development of the instrument for this study. (31-33). Parts I and II were modified from Garrett's rating sheet (31) and included questions regarding student sex, grade, school lunch participation, and reasons for type of lunch selection. Parts III and IV consisted of nonfood and food attitude

items which were adapted from Gutsch's questionnaire (33) with minor changes and the addition of five questions. Instructions to teachers and a standardized narrative (Appendix C) were developed for classroom administration of the school lunch questionnaire.

Pilot Testing. The school lunch questionnaire was pilot tested with one class each of fourth, fifth and sixth grades in a nonstudy school. Following the pilot study, minor revisions were made to develop the final instrument (Appendix C). A comments and suggestions form (AppendixC) completed by the pilot study classroom teachers indicated that the directions to teachers and students were clear and that 10 to 20 minutes of class time were required for completion of the questionnaire.

Data Collection. The school lunch questionnaire was administered in the morning in each school prior to any data collection in the school lunchroom to avoid influencing students' attitudes. The questionnaire and narrative instructions to be read to students were delivered to school offices for distribution to teachers on the day of administration. All fourth, fifth, and sixth grade students with signed consent forms were included in the sample. Questionnaires were dated, coded with the students' identification numbers, and tagged with removable name tags. The narrative stated that name tags could be removed to assure confidentiality and that participation in the study was voluntary. Questionnaires were collected by the teachers in the classrooms, placed in large manilla envelopes, and collected by the researcher in the principals' office by noon on the day of administration.

Lunchroom Data Collection

Menu Selection. Two menus, which included popular and less popular food items, were selected in cooperation with the district food service director. Each menu was served on two study days (Table 1) in the family and cafeteria style food service schools with satellite delivery systems for a total of four days. The second menu was served two to three days later in the same week in each school. Because of differences in food preparation and constraints of time and money, data collection in the on-site cafeteria style food service school was limited to one day of each menu.

Development of Procedures. Differences in the family and cafeteria food service systems required development of different research procedures. Forms and procedures developed for the lunchroom data collection are in Appendix D and E. Two research teams consisting of graduate and undergraduate students were supervised by research coordinators.

Pilot Study. Procedures for lunchroom data collection were pilot tested twice in the study schools for personnel training and evaluation of procedures. Modifications were made in procedures and recording forms as needed.

Family Style Food Service Data Collection. Narrative instructions (Appendix D) were read by teachers in the classrooms before students went to the lunchroom on study days. The instructions included procedures for name cards, weighing of served food, and plate deposit with milk cartons and name cards at the data waste collection area.

Table 1. School Lunchroom Data Collection Schedule

Menu[1]	Day[2]	Date	Serving Style	School
1	1	Nov. 8	Family, satellite	Theodore Roosevelt
		Dec. 13	Cafeteria, satellite	Woodrow Wilson
		Nov. 8	Cafeteria, on-site	Lee
1	2	Nov. 29	Family, satellite	Theodore Roosevelt
		Nov. 29	Cafeteria, satellite	Woodrow Wilson
2	1	Nov. 10	Family, satellite	Theodore Roosevelt
		Dec. 16	Cafeteria, satellite	Woodrow Wilson
		Nov. 10	Cafeteria, on-site	Lee
2	2	Dec. 1	Family, satellite	Theodore Roosevelt
		Dec. 1	Cafeteria, satellite	Woodrow Wilson

[1] Menu 1 = Macaroni/Ground Beef, Green Beans, Coleslaw, Cinnamon Roll, Mixed Fruit Cup, Milk.
Menu 2 = Glazed Ham, Broccoli, Carrot Sticks, Dinner Roll, Cherry Cobbler, Milk.

[2] Day 1 and Day 2 refer to repeat serving of the designated menu.

The research team consisted of a coordinator and six research assistants. Family style food service data collection procedures are listed in Appendix D. The research coordinator was responsible for the preliminary procedures, study day preparation, waste collection, and cleanup. Four assistants assembled their research station equipment (Appendix D) near their three assigned tables according to the arrangement for the data collection (Appendix D). Name cards and table cards (Appendix D) were placed on tables. Student participation by table was recorded on a form (Appendix D) as students were seated.

Served, added and removed food containers were weighed on 1,000 gram, model 1440 Hanson scales. Series 2000 Ohaus balance scales were used for containers weighing more than 1,000 grams. Weights of containers of food passed to another table were recorded when added to that table and reweighed when removed. Table number labels accompanied removed and passed containers for identification of the source. All weights were recorded on color coded forms (Appendix D) to match the name cards, table signs, and waste collection signs.

The fifth research assistant, a kitchen dish deposit checker, observed the dish deposit area to assure that all students from the study tables took their plates to the data waste collection area. A sixth research assistant, a floater, checked to see that students placed name cards and milk cartons on their plates for delivery to the research waste collection area. The research coordinator transferred food waste from students' plates by item into preweighed plastic containers for waste from each table. Food waste in the containers was weighed on a 1,000 gram, Hanson scale and recorded on

forms (Appendix D).

Cafeteria Style Food Service Data Collection. Name tags with identification numbers of students who had permission and who agreed to participate in the study were distributed by teachers in the classrooms before lunch on study days. Narrative instructions (Appendix E) read by teachers included procedures for tray deposit with milk cartons and name tags at the data waste collection area.

A coordinator and seven research assistants comprised the cafeteria style food service research team. Data collection procedures are listed in Appendix E. A research coordinator was responsible for preliminary procedures, study day preparation, assistance with data collection and equipment return. One research assistant collected five trays at random for each grade level from the serving line as students received their trays. The food items on each tray were individually transferred to paper plates, weighed on 500 gram, model 1440 Hanson scales, and the weights were recorded for calculation of average portion sizes (Appendix E). Seven research assistants collected students' trays and measured plate waste according to the procedure recommended by USDA (61). The weights of the paper plates and milk cartons were tared on 500 gram, model 1440 Hanson spring scales. The plate waste was transferred by item to paper plates using rubber scrapers and weights were recorded to the nearest gram on the appropriate form (Appendix E).

Data Analysis

Percentage school lunch participation by school and paying status (full price, reduced price, or free) was calculated by dividing the number of students in each category by the number of

students attending school on each study day. Percentage of enrollment by paying status (reduced price or free) was calculated by dividing the number of approved applications in each category by the number of students enrolled.

School Lunch Questionnaire. Percentages of type of lunch selection, frequency of school lunch participation, reasons for type of lunch selection, and attitude item responses were computed by dividing the number of responses by the number who responded to the question. Attitude responses on seven nonfood related items in part III (items two through five and seven through nine) and the eight food related items in part IV were given a weight of one, two, or three with the most positive response weighted the highest (Appendix C). A nonfood score, food score, and overall attitude score, which were means of the item scores, were computed. The overall score included all fifteen scored items. A general linear model analysis of variance was used to determine attitude differences attributable to serving style. In addition to the analysis of attitude scores, individual items were examined using the chi square test.

Lunchroom Data. The experimental unit for the lunchroom data analysis was the group of students of various grade levels and sexes at a given table. In the school with family style service, students who ate school lunch and were seated at round tables comprised the experimental table unit. At schools with cafeteria style service, experimental table units were artificially created by randomly selecting students to match the composition of the tables in the family style service. Data were collected on individual students in schools with cafeteria style food service.

Variables computed for analysis of served, waste, and intake of food items at table units are listed in Table 2. Served food was defined as the gram weight of food served from the kitchen to the students at a table unit. Waste included food removed in serving containers and/or on students' plates at the end of the meal. Intake was defined as the amount of food consumed by the students at a table unit.

Served, waste, and intake variables were calculated in grams for the table units, divided by the number of students at the table, and expressed as grams per student. Percentage waste and intake were calculated as a percentage of served per student as follows:

$$\text{Mean \% Waste} = \frac{\text{Mean Waste}}{\text{Mean Served}} \times 100$$

$$\text{Mean \% Intake} = \frac{\text{Mean Intake}}{\text{Mean Served}} \times 100$$

The effect of serving style on food served, waste, and intake was examined using general linear models analysis of variance. Least square means were calculated and expressed in grams and percentage of served weights for waste and intake.

Table 2. Variables Computed for Analysis of Served, Waste, and Intake of Food Items at Table Units in Schools with Family and Cafeteria Style Food Service

Variable	Computation
	Family Style Service
Average Container Weight	Average weight of five randomly selected containers (bowls, plates, and platters) used for serving each food item.
Served	Weights of food containers served from the kitchen to a table minus the empty or average container weights for that food item.
Removed Container Waste	Weights of food containers returned to the dish deposit from a table minus the empty or average container weight.
Plate Waste	The weights of containers or students' plate waste from a table minus the weight of the container.
Waste	Removed container waste plus plate waste from a table.
Intake	Weights of served containers from the kitchen plus weights of containers passed from another table minus weights of all containers removed and minus plate waste from a table.
	Cafeteria Style Food Service
Average Portion Size	Average weights of foods on five randomly selected trays at each grade level.
Served	Sum of the average portion sizes for each grade level times the number of randomly assigned students at each grade level at the table.
Waste	Sum of the weights of plate waste of students randomly assigned to the table.
Intake	Served minus waste.

RESULTS AND DISCUSSION

School Lunch Participation

Percentage participation was computed as the ratio of students eating the school lunch on study days to the number of students in attendance. The family style school participation rate ranged from 55.9 to 58.6 percent, the satellite cafeteria style school from 74.1 to 86.4 percent, and the on-site cafeteria style school from 58.7 to 61.8 percent (Table 3). The satellite cafeteria style school had the highest participation rate and the greatest percentage of approved applications for free and reduced price meals (42.2 percent) (Table 4). Percentage of students qualifying for free and reduced price meals has been shown to be a positive predictor of school lunch participation (35). Johnson (49) found that schools with the highest percentage participation had the greatest number of free and reduced price lunch applications.

The on-site cafeteria style school had the lowest percentage of approved applications for free and reduced price meals of the three schools (Table 4) but similiar mean percentage participation (58.7 to 61.8 percent) to the family style school (55.9 to 58.7 percent) (Table 3). In contrast, Johnson (49) reported mean percentage participation in the school lunch program was 59.9 percent in on-site schools and 44.4 percent in satellite schools. Family style service has been reported to increase participation rates (55-60). In this study, the percentage of free and reduced price meals appeared to be

Table 3. Student Participation by School and Paying Status on Data Collection Days at Schools at Schools with Family and Cafeteria Style Food Service

	Serving Style					
	Family, Satellite (N = 290 - 295)[1]		Cafeteria, Satellite (N = 312 - 317)		Cafeteria, On-site (N = 322)	
	Students Participating	%	Students Participating	%	Students Participating	%
Menu 1[2]: Day 1						
Full Price	102	34.9	155	49.7	142	44.1
Reduced Price	12	4.1	23	7.4	16	5.0
Free	56	19.2	76	24.4	31	9.6
Total	170	58.2	254	81.4	189	58.7
Day 2						
Full Price	100	34.5	161	50.8		
Reduced Price	10	3.4	22	6.9		
Free	56	19.3	78	24.6		
Total	173	58.6	261	83.4		
Menu 2[3]: Day 1						
Full Price	107	36.3	171	54.6	151	46.9
Reduced Price	10	3.4	25	8.0	16	5.0
Free	53	18.0	78	24.9	32	9.9
Total	163	55.9	274	86.4	199	61.8
Day 2						
Full Price	112	38.2	133	42.5		
Reduced Price	8	2.7	22	7.0		
Free	52	17.7	77	24.6		
Total	172	58.7	232	74.1		

[1] Number of students in attendance varies becauee of absences and enrollment changes.

[2] Menu 1 = Macaroni/Ground Beef, Green Beans, Coleslaw, Cinnamon Roll, Mixed Fruit Cup, Milk.

[3] Menu 2 = Glazed Ham, Broccoli, Carrot Sticks, Dinner Roll, Cherry Cobblar, Milk.

Table 4. Approved Applications for Free and Reduced Price Lunches Expressed as Percentage of Enrollment at Schools with Family and Cafeteria Style Food Service

	Serving Style		
	Family, Satellite (N = 288)[1]	Cafeteria, Satellite (N = 322)	Cafeteria, On-site (N = 323)
Reduced Price	26	41	17
Free	59	95	35
Total (Reduced and Free)	85	136	52
Percentages of Enrollment	29.5	42.2	16.1

[1] Number of students enrolled on September 15, 1983.

a stronger influence on percentage participation than either on-site food preparation or serving style.

The paying status of school lunch participants expressed as a percentage of students in attendance is listed in Table 3. The number of students who ate free or reduced price lunches remained fairly constant throughout the study. The number of students who purchased lunches at full price fluctuated especially in the satellite cafeteria school. The data indicated that students who pay full price make more day-to-day decisions about school lunch participation.

School Lunch Questionnaire

Lunch Habits. The school lunch questionnaire was completed by fourth, fifth, and sixth grade students with signed consent forms in all three schools. About three-fourths of the students in satellite and on-site cafeteria style schools (75.9 and 73.0 percent, respectively) compared to 61.4 percent of the students in family style school indicated that they usually ate school lunch (Table 5). The percentage of students indicating they ate school lunches three or more times per week agreed closely with the percentage of students indicating they usually ate school lunch. Johnson (49) found a larger percentage of students in on-site schools ate school lunch everyday than in satellite schools. The students who did not eat school lunch usually brought sack lunches and ate in the school lunchroom. Only one student reported usually eating lunch at home.

Reasons for Type of Lunch Selection. Over 75 percent of the students who usually ate school lunch indicated they did so because

Table 5. **Lunch Habits of Fourth, Fifth, and Sixth Grade Students at Schools with Family and Cafeteria Style Food Service**

	Serving Style		
	Family, Satellite (N = 70 to 72)[1]	Cafeteria, Satellite (N = 58 to 60)	Cafeteria, On-site (N = 111 to 113)
	%		
Usual Type of Lunch			
School lunch	61.4	75.9	73.0
Sack lunch	38.6	24.1	26.1
Home lunch	0.0	0.0	0.9
School Lunch Participation			
Everyday	51.4	55.0	50.4
3-4 times/wk	9.7	18.3	19.5
1-2 times/wk	13.9	6.7	15.9
Less than 1 time/wk	16.7	15.0	9.7
Never eat school lunch	8.3	5.0	4.4

[1] N varies because all students did not respond to all questions.

they liked the food (Table 6). Peer pressure (my friends eat school lunch), personal preference (I like to eat school lunch), parents (my parents want me to eat school lunch), and price (it's cheaper to eat school lunch) tended to be given as reasons for selecting school lunch more frequently in the cafeteria style schools than in the family style school.

Students who usually brought sack lunches (18.5 to 21.4 percent) indicated that a dislike of the school lunch food was not a primary factor influencing their decision to bring sack lunches. About three fourths of the students in family style (74.1 percent) and on-site cafeteria style (72.4 percent), but only 35.7 percent of the students in the satellite cafeteria school, responded that they ate sack lunches because they liked them. Over half (71.4 and 62.1 percent) of the students in cafeteria style schools compared to 40.7 percent in the family style school gave price as a reason for eating sack lunches. Fewer than one third of the students who usually eat sack lunches reported that their parents wanted them to eat sack lunches and less than one-sixth were influenced by their friends.

Attitude Scores. Means of attitude scores of fourth, fifth and sixth grade students are listed in Table 7. The nonfood related items concerned students' perceptions of lunchroom atmosphere, personnel attitudes, seating, noise, cleanliness, and time allowed for lunch. No significant differences were found in nonfood scores attributable to serving style. The food related items pertained to food quality, quantity, and acceptance. The overall score was the mean of all items included in nonfood and food scores. The food score and overall

Table 6. Reasons for Type of Lunch Selections by Fourth, Fifth, and Sixth Grade Students at Schools with Family and Cafeteria Style Food Service

Reasons for Usual Type of Lunch Selection	Serving Style: Family, Satellite		Cafeteria, Satellite		Cafeteria, On-site	
	N	%[1]	N	%	N	%
School Lunch	43		44		81	
I like the food		86.0		75.0		90.1
Friends eat school lunch		25.6		43.2		48.1
I like to eat school lunch		34.9		59.1		59.3
Parents want me to		37.2		52.3		40.7
It's cheaper		9.3		22.7		19.8
Sack Lunch	27		14		29	
I don't like school lunch food		18.5		21.4		20.7
Friends eat sack lunches		14.8		7.1		13.8
I like sack lunches		74.1		35.7		72.4
Parents want me to		25.9		28.6		31.0
It's cheaper		40.7		71.4		62.1

[1] Columns do not total to 100% because students could check as many responses as applied in the salected category.

Table 7. Least Square Means and Standard Errors (S.E.) of Attitude Scores* of Fourth, Fifth and Sixth Grade Students at Schools with Family and Cafeteria Style Food Service

	Serving Style					
	Family, Satellite		Cafeteria, Satellite		Cafeteria, On-site	
	Mean**	S.E.	Mean	S.E.	Mean	S.E.
Nonfood Score	2.17^{1}	0.04	2.22^{1}	0.04	2.24^{1}	0.03
Food Score	2.33^{1}	0.04	2.49^{2}	0.04	$2.41^{1,2}$	0.03
Overall Score	2.26^{1}	0.03	2.36^{2}	0.04	$2.33^{1,2}$	0.03

* Higher score = more positive response based on a 3 point scale.

** Where superscripts (1,2) differ horizontally means differ significantly ($p \leq 0.05$) from each other.

score were higher ($p \leq 0.05$) in satellite cafeteria style than in family style. There were no significant differences in attitude scores when on-site cafeteria style was compared to either family style or satellite cafeteria style.

Individual Attitude Items. Individual items in Part III and IV of the School Lunch Questionnaire dealt with the students' perceptions of the school lunch program. The nonfood item responses (Table 8) reflected the students' views of the lunchroom, personnel, and behavior control. With regard to seating arrangements, two-thirds to three-fourths of the students in all three study schools indicated that they sat by their friends at lunch and enjoyed eating with the students who sat with them at lunch. Between 52.7 and 65.0 percent of the students in each school indicated that the lunchroom was somewhat cheerful. Over half of the students (50.9 to 54.0 percent) in the cafeteria style schools but only 37.5 percent in the family style school reported enjoying eating in the lunchroom most of the time.

The cooks were perceived as usually friendly by the majority of the students (69.0 to 92.9 percent) in the three schools; the lunchroom supervisors were considered "usually friendly" by over half of the students in the family and cafeteria satellite schools but by only 27.4 percent in the on-site cafeteria school. Control of behavior during lunch appeared to be greater in the on-site cafeteria than in the other schools, which may have had a negative effect of the evaluation of the lunchroom supervisors. The majority of students in the satellite cafeteria style school perceived a low level of behavior control as indicated by the 58.3 percent who

Table 8. Responses of Fourth, Fifth, and Sixth Grade Students to Nonfood Related Attitude Items at Schools with Family and Cafeteria Style Food Service

Attitude Items Part III	Serving Style			
	Family, Satellite (N = 70 to 72)[1]	Cafeteria, Satellite (N = 58 to 60)	Cafeteria, On-site (N = 113)	
	%	%	%	chi-square
I eat by a friend at lunch:				
Most of the time.	77.8	75.0	92.0	
Some of the time.	18.1	25.0	7.1	
Not at all.	4.2	0.0	0.9	
I like to eat with the students who sit with me at lunch:				
Usually.	73.6	63.8	84.1	
Sometimes.	22.2	34.5	15.9	
Not at all.	4.2	1.7	0.0	
The lunchroom is cheerful:				9.284
Yes, very cheerful.	20.8	15.0	32.1	
Somewhat cheerful.	52.8	65.0	52.7	
Not very cheerful.	26.4	20.0	15.2	
I enjoy eating in the lunchroom:				
Most of the time.	37.5	50.9	54.0	
Some of the time.	50.0	47.5	44.3	
Hardly ever.	12.5	1.7	1.8	
The cooks are:				
Usually friendly.	69.0	80.0	92.9	
Sometimes friendly.	22.5	18.3	6.2	
Often crabby.	8.5	1.7	0.9	
The lunchroom supervisors are:				26.731***
Usually friendly.	59.7	50.0	27.4	
Sometimes friendly.	31.9	32.8	38.1	
Often crabby.	8.3	17.2	34.5	
The lunchroom is too noisy:				6.248
Most of the time.	47.9	37.3	31.9	
Some of the time.	19.7	23.7	19.5	
The noise doesn't bother me.	32.4	39.0	48.7	
We have to be quiet during lunch:				22.789***
Most of the time.	22.5	15.0	39.8	
Some of the time.	35.2	26.7	35.4	
Usually not restricted.	42.3	58.3	24.8	
The supervisors or others in the lunchroom:				27.119***
Usually encourage me to eat.	28.6	10.3	33.6	
Sometimes encourage me to eat.	32.9	20.7	38.1	
Don't say enything about what I eat.	38.6	69.0	28.3	
The lunchroom is clean:				18.978***
Most of the time.	33.3	27.1	25.7	
I don't really notice.	48.6	28.8	55.8	
Some of the time.	18.1	44.1	18.6	
We are rushed during lunch:				20.413***
Most of the time.	25.4	28.3	34.5	
Some of the time.	59.2	26.7	40.7	
Not at all.	15.5	45.0	24.8	

[1] N varies because all students did not respond to all questions.
*** $p \leq 0.001$

reported that noise was not usually restricted and 69.0 percent who responded that supervisors "don't say anything about what I eat."

About half of the students in the family style school and on-site cafeteria style school (48.6 and 55.8 percent, respectively), but only 28.8 percent in satellite cafeteria, responded that they did not really notice if the lunchroom was clean. In the satellite cafeteria school, with a higher participation rate, 44.1 percent of the students reported that the lunchroom was clean only some of the time. In contrast, Gargano (39) reported that significantly more frequent than infrequent participants identified the lunchroom as clean. In our study, students in the family style school assisted in table cleanup, but no difference in their perception of cleanliness was evident.

The majority of students (84.5 percent in family style, 55.0 percent in satellite cafeteria, and 75.2 percent in on-site cafeteria) indicated that they were rushed during lunch most or some of the time. The family style school students had a 30 minute lunch period compared to about 40 minutes of lunch and recess combined in the cafeteria schools. Students in the family style felt rushed which may be attributed to the time required for serving family style and the need to return to class on time.

Food related attitude items (Table 9) were analyzed individually to determine the sources of the significant difference in the food scores in satellite cafeteria and family style schools. The chi square test did not indicate significant differences among schools on any individual food related items.

Table 9. Responses of Fourth, Fifth, and Sixth Grade Students to Food Related Attitude Items[1] at Schools with Family and Cafeteria Style Food Service

Attitude Items Part IV	Serving Style		
	Family, Satellite (N = 66 to 67)[2] %	Cafeteria, Satellite (N = 53 to 54) %	Cafeteria, On-site (N = 111) %
The food in the school lunch is:			
Almost always good.	37.9	46.3	46.9
Good some of the time.	53.0	50.0	46.9
Usually not very good.	9.1	3.7	6.3
I like the meat dishes:			
Most of the time.	47.0	52.8	46.9
Some of the time.	37.9	37.7	42.3
Not very often.	15.2	9.4	10.8
I like the vegetables:			
Most of the time.	16.7	33.3	16.2
Some of the time.	33.3	35.2	38.7
Not very often.	50.0	31.5	45.1
I like the desserts:			
Most of the time.	69.7	75.9	87.4
Some of the time.	27.3	24.1	10.8
Not very often.	3.0	0.0	1.8
The hot foods (like meats and vegetables) are:			
Usually hot enough.	41.8	53.7	50.5
Sometimes only warm.	43.3	35.2	42.3
Often cold.	14.9	11.1	7.2
The cold foods (like salads and fruits) are:			
Usually cold.	58.2	64.8	58.6
Sometimes cold.	23.9	31.5	31.5
Often not cold enough.	17.9	3.7	9.9
When I eat school lunch I usually:			
Eat most of my food.	80.6	74.1	78.4
Eat about half of my food.	16.4	22.2	19.8
Leave a lot of my food.	3.0	3.7	1.8
The amount of food on my plate is about right:			
Most of the time.	43.9	57.4	49.6
Some of the time.	37.9	29.6	22.5
I don't get enough to eat.	18.2	13.0	27.9
I believe I should eat:			
All of my food.	28.2	16.7	18.6
At least some of each food.	40.9	66.7	49.6
Only what I want to eat.	31.0	16.7	31.6

[2] Chi square values were non significant for food related attitude items.
[1] N varies because all students did not respond to all questions.

Few students (3.7 to 9.1 percent) indicated that the food was usually not very good. The majority of students (69.7 to 87.4 percent) reported they liked desserts most of the time and about half (46.9 to 52.8) indicated they liked meat dishes most of the time. Very few students in family and on-site cafeteria style schools (16.6 and 16.2, respectively) responded that they liked the vegetables most of the time and nearly half (50.0 and 45.1 percent) reported they seldom liked the vegetables. In the satellite cafeteria school, 33.3 percent of the students indicated they liked vegetables most of the time, and 31.5 percent indicated not very often. Gargano's study (32) of high school students showed that vegetables were more acceptable to frequent than infrequent participants, although all students had more negative attitudes toward vegetables than other menu items. In our satellite cafteteria school, where participation rates were higher, the students tended to have more postive attitudes about vegetables than in the family style or on-site cafeteria schools. About half of the cafeteria style school students (53.7 to 50.5 percent), but only 41.8 percent of the family style school students, reported hot foods were usually served hot. In addition to the negative effect of satellite service on hot food temperatures, family style service may also result in heat loss from food at the table. The majority of students in all schools (58.2 to 64.8 percent) reported cold foods were usually cold.

Because correct serving size is important to cost control, student satisfaction, and nutritional adequacy of the school lunch program, three questions pertained to students' perceptions of amounts of food served and eaten. The majority of students (74.1 to

80.6 percent) responded that they usually ate most of their food. In studies reported by Gargano (32) and Garrett and Vaden (31), students usually responded that they ate most of their food. Garrett and Vaden (31) also found frequent school lunch participants reported they consumed more of their food than infrequent participants. About half of the cafeteria style school students (49.6 to 57.4 percent) indicated the amount of food on their plates was about right most of the time; but only 43.9 percent in family style, where students determined the amount of food they put on their plates, gave that response. The response to the amount of food could have been affected by too much or not enough food. Some students in each school (18.2 percent in family style, 13.0 percent in satellite cafeteria, and 27.9 percent in on-site cafeteria style) reported that they did not get enough to eat. Food preference, amount served, and time allowed to eat lunch may have influenced their response. In family style service, we observed that students had difficulty limiting their serving sizes on non-portioned, favorite food items to allow all students at the table to receive a portion. About half (49.6 to 66.7 percent) of the cafeteria style school students and 40.9 percent of the family style school students reported they believed they should eat at least some of each food. Students in the family style school may have felt less obligated to eat some of each food because they served themselves. About 28 percent of the family style school students, compared to 16.7 to 18.6 percent of the cafeteria style school students, indicated they believed they should eat all of their food. The family style students may have thought they should eat all the food on their plates because they determined

the serving size.

Lunchroom Data

The effect of serving style on food served, wasted, and consumed was examined using general linear models analysis of variance (Table 10). Least square means and standard errors were calculated and expressed in grams and percentage of served weights for waste and intake (Tables 11-16).

Main Dish. Least square means and standard errors of served, waste, and intake (gms, %) of main dish per student at schools with family and cafeteria style food service are listed in Table 11. Data from schools with satellite food preparation showed that gram means of served main dish were higher ($p \leq 0.05$) in family style than in cafeteria style on three out of four days. Waste expressed as gram and percentage means of main dish was lower $p \leq 0.05$) on one day in family style compared to satellite cafeteria and tended to be lower on other days except gram mean on one day. Intake expressed as gram mean was higher ($p \leq 0.05$) in family style compared to satellite cafeteria style on the two days ham was served and tended to be higher on the days macaroni with ground beef was served. Percentage mean intake was higher ($p \leq 0.05$) in family style compared to satellite cafeteria on one day when macaroni with ground beef was served and tended to be higher all other days. In general, at the family style school there was a tendency toward higher served weights of main dish, lower waste, and higher intakes per student than at the satellite cafeteria school. Based on an observation of the

Table 10. Analysis of Variance of Grams of School Lunch Items at Schools with Family and Cafeteria Style Food Service

Source of Variation	df	Mean Squares					
		Main Dish	Vegetable	Salad	Roll	Dessert	Milk
Menu 1[1], Day 1							
Served							
School	2	4600.35***	469.01***	4901.02***	994.67***	2070.14***	31.20
Error	66	83.41	35.49	39.80	20.21	35.13	456.37
Waste							
School	2	1616.92*	36.55	302.24	31.30	2510.34***	3609.25
Error	66	363.76	147.24	140.13	24.01	116.90	1305.59
Intake							
School	2	5171.09**	412.87	3876.60***	1224.80***	3404.14***	3000.16
Error	66	737.17	199.94	145.16	33.08	149.98	1208.21
Menu 1, Day 2							
Served							
School	1	8176.19**	6.66	1316.42***	931.98***	529.67***	271.16
Error	42	728.95	58.72	67.42	35.31	29.09	152.82
Waste							
School	1	389.81	112.73	7.44	0.83	38.10	1973.59
Error	42	2022.32	302.34	235.67	39.19	128.82	1820.59
Intake							
School	1	12517.97	111.33	1536.49**	480.38*	871.14*	781.67
Error	42	3125.78	273.44	135.62	101.45	104.16	1803.87
Menu 2[2], Day 1							
Served							
School	2	3122.73***	2596.73***	1275.38***	171.28***	21684.02***	257.25
Error	63	27.01	26.99	1.73	8.31	90.49	342.47
Waste							
School	2	563.22***	4792.54***	952.14***	1.64	5053.76***	6466.35*
Error	63	62.70	129.67	8.57	20.26	302.10	1476.12
Intake							
School	2	1433.31***	537.98	215.27***	175.91**	6397.55***	4263.02
Error	63	62.92	233.28	10.35	27.81	453.79	1368.70
Menu 2, Day 2							
Served							
School	1	1414.84***	616.80*	117.15***	6.64	2185.31**	53.24
Error	42	25.13	87.43	2.00	3.94	185.43	111.23
Waste							
School	1	4.24	34.60	108.64***	29.76	1881.37**	7622.64*
Error	42	36.33	274.25	6.32	24.33	202.92	1302.00
Intake							
School	1	1264.18***	338.37	451.49***	8.29	8466.77***	8949.98*
Error	42	62.67	135.68	4.39	28.25	454.72	1370.85

[1] Menu 1 = Macaroni/Ground Beef, Green Beans, Coleslaw, Cinnamon Roll, Mixed Fruit Cup, Milk.
[2] Menu 2 = Glazed Ham, Broccoli, Carrot Sticks, Dinner Roll, Cherry Cobbler, Milk.

* $p \leq 0.05$ ** $p \leq 0.01$ *** $p \leq 0.001$

Table 11. Least Square Means and Standard Errors (S.E.) of Served, Waste and Intake (gms,%) of Main Dish per Student at Schools with Family and Cafeteria Style Food Service

	Serving Style					
	Family, Satellite		Cafeteria, Satellite		Cafeteria, On-site	
	Mean*	S.E.	Mean	S.E.	Mean	S.E.
Menu 1: Macaroni/Beef, Green Beans, Colsslaw, Cinnamon Roll, Mixed Fruit Cup, Milk						
Day 1: Macaroni/Beef						
Served, gms	124.32[1]	1.86	126.58[1]	1.86	149.35[2]	1.86
Waste, gms	25.24[1]	3.89	41.55[2]	3.89	34.96[1,2]	3.89
%	20.3[1]	3.0	32.8[2]	3.0	23.4[1]	3.0
Intake, gms	99.55[1,2]	5.54	85.03[1]	5.54	114.38[2]	5.54
%	80.0[1]	4.2	67.2[2]	4.2	76.6[1]	4.2
Day 2: Macaroni/Beef						
Served, gms	195.52[1]	5.64	168.83[2]	5.64		
Waste, gms	60.31[1]	9.39	66.14[1]	9.39		
%	30.8[1]	4.6	39.2[1]	4.6		
Intake, gms	135.72[1]	11.67	102.69[1]	11.67		
%	69.4[1]	5.9	60.8[1]	5.9		
Menu 2: Glazed Ham, Broccoli, Carrot Sticks, Dinner Roll, Cherry Cobbler, Milk						
Day 1: Glazed Ham						
Served, gms	41.56[1]	1.08	32.75[2]	1.08	55.86[3]	1.08
Waste, gms	3.25[1]	1.65	4.92[1]	1.65	12.54[2]	1.65
%	7.8[1]	2.9	15.0[1,2]	2.9	22.4[2]	2.9
Intake, gms	38.31[1]	1.66	27.84[2]	1.66	43.32[3]	1.66
%	92.2[1]	2.9	85.0[1,2]	2.9	77.6[2]	2.9
Day 2: Glazed Ham						
Served, gms	47.92[1]	1.05	36.82[2]	1.05		
Waste, gms	6.14[1]	1.26	5.53[1]	1.26		
%	12.8[1]	3.1	15.0[1]	3.1		
Intake, gms	41.78[1]	1.65	31.29[2]	1.65		
%	87.2[1]	3.1	85.0[1]	3.1		

* Where superscripts (1,2,3) on means differ horizontally, means differ significantly ($p \leq 0.05$) from each other.

satellite cafeteria school. Based on an observation of the percentage of children leaving more than one half of a portion uneaten, Heimberg (60) found no difference in entree waste when family and cafeteria style were compared.

In this study, the range of mean percentage main dish waste in the family style school was 7.8 to 30.8 compared to 15.0 to 39.2 in the satellite cafeteria school. In cafeteria style schools, Johnson (49) found a mean percent range of 15.8 to 48.6 for a variety of entrees and Jansen and Harper (41) reported 17.4 to 33.3 percent mean waste for meat items.

A comparison of family style and cafeteria style with on-site food preparation showed higher ($p \leq 0.05$) gram means of served on both days and intake of main dish on the day ham was served in on-site cafeteria style. Gram and percentage waste was higher ($p \leq 0.05$) in on-site cafeteria style than family style on the day ham was served and tended to be higher when macaroni with ground beef was served. Even though the gram means of intake were higher in on-site cafeteria style compared to family style, percentage mean of intake was lower ($p \leq 0.05$) when ham was served and tended to be lower when macaroni with ground beef was served. The lower percentage mean intake may have been attributable to the higher waste associated with higher served weights of the main dish.

Vegetable. There was no consistent pattern in gram means of served vegetable when family and cafeteria style were compared (Table 12). The gram mean of served broccoli was higher ($p \leq 0.05$) in family style on one day and in satellite cafeteria style on the other day.

Table 12. Least Square Means and Standard Errors (S.E.) of Served, Waste and Intake (gms,%) of Vegetable per Student at Schools with Family and Cafeteria Style Food Service

	Serving Style					
	Family, Setellite		Cafeteria, Setellite		Cafetsria, On-site	
	Mean*	S.E.	Mean	S.E.	Mean	S.E.
Menu 1: Macaroni/Beef, Green Beans, Coleelew, Cinnamon Roll, Mixed Fruit Cup, Milk						
Day 1: Green Beans						
Served, gms	47.31^{1}	1.22	50.58^{1}	1.22	56.06^{2}	1.22
Waste, gms	20.05^{1}	2.48	22.51^{1}	2.48	21.14^{1}	2.48
%	42.4^{1}	5.1	44.5^{1}	5.1	37.7^{1}	5.1
Intake, gms	27.46^{1}	2.89	28.06^{1}	2.89	34.92^{1}	2.89
%	58.0^{1}	5.4	55.5^{1}	5.4	62.3^{1}	5.4
Day 2: Green Beans						
Served, gms	44.57^{1}	1.60	45.33^{1}	1.60		
Waste, gms	21.70^{1}	3.63	24.83^{1}	3.63		
%	48.7^{1}	6.9	54.8^{1}	6.9		
Intake, gms	23.62^{1}	3.45	20.50^{1}	3.45		
%	53.0^{1}	8.3	45.2^{1}	8.3		
Menu 2: Glazed Ham, Broccoli, Carrot Sticks, Dinner Roll, Cherry Cobbler, Milk						
Day 1: Broccoli						
Served, gms	35.61^{1}	1.08	39.99^{2}	1.08	55.82^{3}	1.08
Waste, gms	16.19^{1}	2.38	27.17^{2}	2.38	44.83^{3}	2.38
%	45.5^{1}	5.5	67.9^{2}	5.5	80.3^{2}	5.5
Intake, gms	20.14^{1}	3.12	$12.82^{1,2}$	3.12	10.99^{2}	3.12
%	56.6^{1}	8.8	32.1^{2}	8.8	19.7^{2}	8.8
Day 2: Broccoli						
Served, gms	45.34^{1}	1.95	38.01^{2}	1.95		
Waste, gms	28.35^{1}	3.46	26.62^{1}	3.46		
%	62.5^{1}	6.3	70.0^{1}	6.3		
Intake, gms	16.82^{1}	2.43	11.39^{1}	2.43		
%	37.1^{1}	6.1	30.0^{1}	6.1		

* Whers euperecripts (1,2,3) on means differ horizontelly, meane differ significantly ($p < 0.05$) from each other.

Gram and percentage mean vegetable waste was less ($p \leq 0.05$) in the family style than in satellite cafeteria style on one day when broccoli was served and tended to be less on the days green beans were served. The percentage mean intake was higher ($p \leq 0.05$) in family style compared to satellite cafeteria on day when broccoli was served; gram and percentage means of vegetable intake each tended to be higher in family style on three days of the study. In general, at the family style school there was a tendency toward lower waste and higher intakes of vegetable per student than at the satellite cafeteria school. Heimberg (60) found mean vegetable waste was lower when foods were served family style than by regular cafeteria style. The family style service reduced percentage waste significantly compard to cafeteria style service. Intake did not appear to vary according to serving style in Heimberg's study.

The range of mean percentage waste in our family style school was 42.4 to 62.5 compared to 44.5 and 70.0 in the satellite cafeteria style school. In cafeteria style schools, Johnson (49) found a mean percentage range of 62.3 to 71.4 for four different vegetables with an average of 69.3 percent vegetable waste, and Jansen and Harper (41) reported a range of 44.6 to 64.8 percent waste for vegetables.

The on-site cafeteria style school served more ($p \leq 0.05$) vegetables on both days than the family style school. Gram and percentage mean waste for on-site cafeteria style was higher ($p \leq 0.05$) on the day broccoli was served resulting in lower ($p \leq 0.05$) gram and percentage intake of broccoli. Percentage mean waste tended to be lower in on-site cafeteria style than in family style when green beans were served resulting in a tendency toward higher gram and

percentage mean intake of green beans. Johnson (49) found vegetable waste from the satellite cafeteria systems tended to be higher than in on-site cafeteria systems. We found less vegetable waste in the satellite family style service than in the on-site cafeteria.

Salad. Gram means of served and gram and percentage mean of intake of salad were higher ($p \leq 0.05$) in family style than satellite cafeteria style on all study days (Table 13). Gram means of salad waste were lower ($p \leq 0.05$) in family style than in satellite cafeteria on days when carrot sticks were served and tended to be lower on days when coleslaw was served. Percentage means of waste were lower ($p \leq 0.05$) in family style compared to satellite cafeteria on all study days. Based on lower waste and higher intake of salad, family style service was superior to cafeteria style service.

The range of mean percentage waste in the family style school was 9.6 to 51.5 compared to 34.4 to 73.2 in the satellite cafeteria school. Jansen and Harper (41) reported 46.9 percent mean waste for salad in cafeteria style food service schools.

When family style and on-site cafeteria were compared, the gram mean of served coleslaw was higher ($p \leq 0.05$) in family style while gram mean of served carrot sticks was higher ($p \leq 0.05$) in on-site cafeteria style. There was a pattern of lower salad waste in family style compared to on-site cafeteria style with lower ($p \leq 0.05$) gram mean carrot stick waste and lower percentage mean waste for both salads. The gram mean intake of coleslaw and percentage mean intake of both salads were higher ($p \leq 0.05$) in family style than in on-site cafeteria style. The higher gram mean of served carrot sticks on on-

Table 13. Least Square Means and Standard Errors (S.E.) of Served, Waste and Intake (gms,%) of Salad per Student at Schools with Family and Cafeteria Style Food Service

	Serving Style					
	Family, Satellite		Cafeteria, Satellite		Cafeteria, On-site	
	Mean*	S.E.	Mean	S.E.	Mean	S.E.
Menu 1: Macaroni/Beef, Green Beans, Coleslaw, Cinnamon Roll, Mixed Fruit Cup, Milk						
Day 1: Coleslaw						
Served, gms	58.16^{1}	1.29	43.35^{2}	1.29	29.59^{3}	1.29
Waste, gms	$29.97^{1,2}$	2.42	31.72^{1}	2.42	24.89^{2}	2.42
%	51.5^{1}	4.9	73.2^{2}	4.9	84.1^{2}	4.9
Intake, gms	29.34^{1}	2.46	11.63^{2}	2.46	4.70^{2}	2.46
%	50.4^{1}	5.1	26.8^{2}	5.1	15.9^{2}	5.1
Day 2: Coleslaw						
Served, gms	48.50^{1}	1.71	37.79^{2}	1.71		
Waste, gms	24.81^{1}	3.20	25.62^{1}	3.20		
%	51.2^{1}	5.8	67.8^{2}	5.8		
Intake, gms	23.74^{1}	2.43	12.17^{2}	2.43		
%	48.9^{1}	5.9	32.2^{2}	5.9		
Menu 2: Glazed Ham, Broccoli, Carrot Sticks, Dinner Roll, Cherry Cobbler, Milk						
Day 1: Carrot Sticks						
Served, gms	15.09^{1}	0.27	11.64^{2}	0.27	25.92^{3}	0.27
Waste, gms	1.45^{1}	0.61	4.00^{2}	0.61	13.66^{3}	0.61
%	9.6^{1}	3.3	34.4^{2}	3.3	52.7^{3}	3.3
Intake, gms	13.43^{1}	0.67	7.64^{2}	0.67	12.26^{1}	0.67
%	89.0^{1}	3.3	65.6^{2}	3.3	47.3^{3}	3.3
Day 2: Carrot Sticks						
Served, gms	12.10^{1}	0.30	8.91^{2}	0.30		
Waste, gms	2.66^{1}	0.52	5.73^{2}	0.52		
%	22.0^{1}	4.7	64.3^{2}	4.7		
Intake, gms	9.44^{1}	0.44	3.17^{2}	0.44		
%	78.0^{1}	4.7	35.6^{2}	4.7		

* Where superscripts (1,2,3) on means differ horizontally, means differ significantly ($p < 0.05$) from each other.

site cafeteria did not result in higher intake of that food.

Rolls. The family style schools served more grams of roll per student than the satellite cafeteria school with higher ($p \leq 0.05$) gram mean of served rolls on three of four study days (Table 14). This difference was unexpected since the rolls are baked in the same base kitchen with the same portion control techniques and one roll per student is served in each school. The standard portion determinations also showed high variation among the rolls. Differences in gram and percentage means of roll waste were slight. Cinnamon roll intake was higher ($p \leq 0.05$) in family style compared to satellite cafeteria style and was related directly to the higher gram mean served. Variations in percentage intake were slight with a range of 85.7 percent to 95.6 percent indicating that most of the rolls served were consumed. The gram mean served was the primary factor affecting intake. Jansen and Harper (41) found that 77.9 percent of bread and cereal products and baked desserts including sweet rolls were consumed in a study of cafeteria style schools.

In a comparison of family and on-site cafeteria styles, the gram mean of served cinnamon roll was higher ($p \leq 0.05$) in family style while gram mean of dinner roll was higher ($p \leq 0.05$) in on-site cafeteria style. Percentage mean on cinnamon roll waste was lower ($p \leq 0.05$) in family style than in on-site cafeteria style and gram mean of cinnamon roll waste tended to be less. The higher gram mean of served cinnamon roll in the family style school resulted in higher ($p \leq 0.05$) gram and percentage means of intake in family style than in on-site cafeteria style.

Table 14. Least Square Means and Standard Errors (S.E.) of Served, Waste and Intake (gms,%) of Rolls per Student at Schools with Family and Cafeteria Style Food Service

	Serving Style					
	Family, Satellite		Cafeteria, Satellite		Cafeteria, On-site	
	Mean*	S.E.	Mean	S.E.	Mean	S.E.
Menu 1: Macaroni/Beef, Green Beans, Coleslaw, Cinnamon Roll, Mixed Fruit Cup, Milk						
Day 1: Cinnamon Roll						
Served, gms	68.38^{1}	0.92	57.52^{2}	0.92	56.97^{2}	0.92
Waste, gms	3.01^{1}	1.00	3.08^{1}	1.00	5.02^{1}	1.00
%	4.4^{1}	1.6	$5.4^{1,2}$	1.6	8.8^{2}	1.6
Intake, gms	65.3^{1}	1.17	54.44^{2}	1.17	51.95^{2}	1.17
%	95.6^{1}	1.6	$94.6^{1,2}$	1.6	91.2^{2}	1.6
Day 2: Cinnamon Roll						
Served, gms	69.71^{1}	1.24	60.70^{2}	1.24		
Waste, gms	4.67^{1}	1.31	4.40^{1}	1.31		
%	6.7^{1}	2.0	7.2^{1}	2.0		
Intake, gms	62.76^{1}	2.10	56.29^{2}	2.10		
%	90.0^{1}	2.7	92.7^{1}	2.7		
Menu 2: Glazed Ham, Broccoli, Carrot Sticks, Dinner Roll, Cherry Cobbler, Milk						
Day 1: Dinner Roll						
Served, gms	40.25^{1}	0.60	37.75^{2}	0.60	43.21^{3}	0.60
Waste, gms	4.17^{1}	0.94	4.66^{1}	0.94	4.59^{1}	0.94
%	10.4^{1}	2.3	12.3^{1}	2.3	10.6^{1}	2.3
Intake, gms	$36.08^{1,2}$	1.10	33.09^{1}	1.10	38.62^{2}	1.10
%	89.6^{1}	2.3	87.7^{1}	2.3	89.4^{1}	2.3
Day 2: Dinner Roll						
Served, gms	38.12^{1}	0.41	37.36^{1}	0.41		
Waste, gms	5.46^{1}	1.03	3.85^{1}	1.03		
%	14.3^{1}	2.7	10.3^{1}	2.7		
Intake, gms	32.66^{1}	1.11	33.51^{1}	1.11		
%	85.7^{1}	2.7	89.7^{1}	2.7		

* Where superscripts (1,2,3) on means differ horizontally, means differ significantly ($p \leq 0.05$) from each other.

Dessert. Gram means of served desserts were higher ($p \leq 0.05$) in family style compared to satellite cafeteria style on two days of the study and higher ($p \leq 0.05$) in satellite cafeteria style than in family style on one study day (Table 15). Gram means of dessert waste were lower ($p \leq 0.05$) in family style compared to satellite cafeteria style on the three days and tended to be lower on the fourth day. Percentage means of dessert waste were lower in family style than in satellite cafeteria style on all study days. Gram means of intake were higher ($p \leq 0.05$) in family style compared to satellite cafeteria on three days and tended to be higher on one day; percentage means were higher ($p \leq 0.05$) on all study days. In general, family style food service resulted in lower waste and higher intakes of dessert than cafeteria style food service. In a comparison of family and cafeteria style services, Heimberg (60) found no differences in fruit waste based on an observation of the percentage of children leaving more than one half of a portion uneaten.

The range of mean percentage dessert waste in our family style service was 20.9 to 52.8 compared to 34.0 to 88.0 in our cafeteria style service. In cafeteria style schools Jansen and Harper (41) reported 28.1 percent waste of fruit desserts and juices. The high waste values in our study were for the mixed fruit cup which was partially frozen and may have decreased its acceptability.

Gram means of served dessert were over one and one third times greater for mixed fruit cup and one and one half times greater for cherry cobbler in on-site cafeteria style compared to family style. On-site cafeteria style gram mean dessert waste was higher ($p \leq 0.05$) than in family style on both days resulting in a higher ($p \leq 0.05$)

Table 15. Least Square Means and Standard Errors (S.E.) of Served, Waste and Intake (gms,%) of Dessert per Student at Schools with Family and Cafeteria Style Food Service

	Serving Style					
	Family, Satellite		Cafeteria, Satellite		Cafeteria, On-site	
	Mean[1]	S.E.	Mean	S.E.	Mean	S.E.
Menu 1: Macaroni/Beef, Green Beans, Colsslaw, Cinnamon Roll, Mixed Fruit Cup, Milk						
Day 1: Mixed Fruit Cup						
Served, gms	44.53[1]	1.21	45.22[1]	1.21	60.95[2]	1.21
Waste, gms	19.67[1]	2.21	39.78[2]	2.21	32.95[3]	2.21
%	44.2[1]	4.5	88.0[2]	4.5	54.1[1]	4.5
Intake, gms	23.33[1]	2.50	5.44[2]	2.50	28.00[1]	2.50
%	52.4[1]	5.1	12.0[2]	5.1	45.9[1]	5.1
Day 2: Mixed Fruit Cup						
Served, gms	42.57[1]	1.13	35.78[2]	1.13		
Waste, gms	22.47[1]	2.37	24.29[1]	2.37		
%	52.8[1]	5.4	67.9[2]	5.4		
Intake, gms	20.20[1]	2.13	11.48[2]	2.13		
%	47.5[1]	5.5	32.1[2]	5.5		
Menu 2: Glazed Ham, Broccoli, Carrot Sticks, Dinner Roll, Cherry Cobbler, Milk						
Day 1: Cherry Cobbler						
Served, gms	74.18[1]	1.99	88.97[2]	1.99	133.24[3]	1.99
Waste, gms	15.52[1]	3.63	30.25[2]	3.63	45.19[3]	3.63
%	20.9[1]	3.4	34.0[2]	3.4	33.9[2]	3.4
Intake, gms	59.56[1]	4.45	58.73[1]	4.45	88.05[2]	4.45
%	80.3[1]	4.2	66.0[2]	4.2	66.1[2]	4.2
Day 2: Cherry Cobbler						
Served, gms	79.22[1]	2.84	65.42[2]	2.84		
Waste, gms	18.74[1]	2.97	31.55[2]	2.97		
%	23.7[1]	3.9	48.2[2]	3.9		
Intake, gms	61.04[1]	4.45	33.88[2]	4.45		
%	77.1[1]	5.0	51.8[2]	5.0		

* Where superscripts (1,2,3) on means differ horizontally, means differ significantly ($p \leq 0.05$) from each other.

percentage dessert waste on the day cherry cobbler was served and a tendency to be higher on the day mixed fruit was served. The very high served weights of dessert in on-site cafeteria style compared to family style resulted in higher gram intake of cherry cobbler and a tendency to be higher for mixed fruit cup in the on-site cafeteria school. The percentage mean intake was lower ($p \leq 0.05$) for cherry cobbler and tended to be lower for mixed fruit cup in on-site cafeteria style compared to family style.

Milk. There were no significant differences in gram means of served milk (Table 16) in family style versus satellite cafeteria style indicating that the serving style had little effect on the number of students who selected milk. Gram and percentage means of milk waste tended to be lower and gram and percentage intake tended to be higher in satellite cafeteria compared to family style, but the differences were significant on only one day of the study. The higher intake of other foods, especially salads and desserts, in the family style service may have contributed to higher milk waste and lower milk consumption compared to satellite cafeteria.

Gram mean served milk tended to be higher in family style compard to on-site cafeteria indicating slightly more students selected milk in family style. In contrast, gram and percentage mean waste on both study days were lower ($p \leq 0.05$) and intakes were higher ($p \leq 0.05$) in on-site cafeteria compared to family style.

Table 16. Least Square Means and Standard Errors (S.E.) of Served, Waste and Intake (gms,%) of Milk per Student at Schools with Family and Cafeteria Style Food Service

	Serving Style					
	Family, Satellite		Cafeteria, Satellite		Cafeteria, On-site	
	Mean*	S.E.	Mean	S.E.	Mean	S.E.
Menu 1: Macaroni/Beef, Green Beans, Coleslaw, Cinnamon Roll, Mixed Fruit Cup, Milk						
Day 1: Milk						
Served, gms	240.44[1]	4.36	238.44[1]	4.36	238.50[1]	4.36
Waste, gms	78.78[1]	7.38	61.74[1,2]	7.38	54.98[2]	7.38
%	32.8[1]	4.5	25.9[1,2]	4.5	23.1[2]	4.5
Intake, gms	161.66[1]	7.10	176.70[1,2]	7.10	183.51[2]	7.10
%	67.2[1]	3.0	74.1[1,2]	3.0	76.9[2]	3.0
Day 2: Milk						
Served, gms	247.38[1]	2.58	242.52[1]	2.58		
Waste, gms	83.54[1]	8.9	70.43[1]	8.9		
%	33.8[1]	3.6	29.0[1]	3.6		
Intake, gms	163.84[1]	8.86	172.09[1]	8.86		
%	66.2[1]	3.6	71.0[1]	3.6		
Menu 2: Glazed Ham, Broccoli, Carrot Sticks, Dinner Roll, Cherry Cobbler, Milk						
Day 1: Milk						
Served, gms	245.27[1]	3.86	244.36[1]	3.86	239.07[1]	3.86
Waste, gms	79.40[1]	8.02	65.05[1,2]	8.02	45.95[2]	8.02
%	32.4	3.2	26.6[1,2]	3.2	19.2[2]	3.2
Intake, gms	165.87[1]	7.72	179.31[1,2]	7.72	193.13[2]	7.72
%	67.6[1]	3.2	73.4[1,2]	3.2	80.8[2]	3.2
Day 2: Milk						
Served, gms	245.39[1]	2.20	247.54[1]	2.20		
Waste, gms	80.00[1]	7.53	54.23[2]	7.53		
%	32.6[1]	3.1	21.9[2]	3.1		
Intake, gms	165.39[1]	7.73	193.31[2]	7.73		
%	67.4[1]	3.1	78.1[2]	3.1		

* Where superscripts (1,2,3) on means differ horizontally, means differ significantly ($p < 0.05$) from each other.

CONCLUSIONS

The satellite cafeteria school had the highest percentage participation rate and greatest percentage of free and reduced price lunches among the schools. The students' food and overall attitude scores on the school lunch questionnaire were significantly higher in the satellite cafeteria than in the family style food service. Individual item analysis did not determine the source of the difference. The higher percentage of free and reduced price lunches may have contributed to the higher attitude scores and the participation rate in the satellite cafeteria school.

More food was served to students in the family style school than in the cafeteria style school. The family style school served significantly more salad on all four days, more main dish and roll on three days, more dessert on two days, and more vegetable on one day. The satellite cafeteria school served more vegetable on only one day. Each satellite school should have received the same amount of food per student from the base kitchen but the quantity delivered to the kitchens was not assessed in this study. Assuming that the same amount of food was delivered to each satellite school, a greater proportion of the food delivered was served to the students in the family style school than in the cafeteria style school.

In general, family style food service resulted in significantly lower waste and higher intakes of salad and dessert than satellite cafeteria style food service. Main dish and vegetable waste tended to be lower and intake higher in family style than in satellite cafeteria style service. A tendency toward higher intake of rolls in

family style than in satellite cafeteria style service was directly related to the higher served roll weights. In our study, we found that family style service with satellite food delivery resulted in less waste and more intake of food compared to satellite cafeteria style service.

The on-site cafeteria style school served more main dish, vegetable, and dessert than the family style school. More food per student may have been prepared in the on-site preparation kitchen, thus preventing conclusions concerning the effect of serving style on quantities of food served. In general, family style service resulted in lower waste for all foods, except milk, compared to on-site cafeteria. Higher served weights of main dish and dessert in on-site cafeteria style compared to family style tended to result in higher gram means of intake but lower percentage mean intakes for those foods. Vegetable, salad, and roll intakes tended to be higher in family style than on-site cafeteria style.

SUMMARY

The Omnibus Reconciliation Act of 1981, which authorized the extension of the "offer versus serve" option in elementary schools, allowed greater serving style flexibility. As a result, variations in serving style have been implemented in some elementary schools.

Family style service has been reported to increase participation rates and decrease food waste. The objectives of this research were to compare students' attitudes, food waste, and food intake in schools with family and cafeteria style food service. The study was conducted at three elementary schools: one with family style, satellite food delivery; one with cafeteria style, satellite food delivery; and one with cafeteria style, on-site food preparation.

Initially a school lunch questionnaire was administered to fourth, fifth, and sixth grade students to study students' attitudes. Lunchroom data were collected on weights of food served and bowl and plate waste of students in grades one through six who ate lunch at tables in the family style service. At schools with cafeteria style service, weights of standard portion sizes were determined and waste data were collected on individual students. Experimental table units were created artificially at cafeteria schools by randomly selecting students to match the composition of the table in the family style service. Served, waste, and intake of food were calculated and expressed as grams and percentage means of served food per student.

The students' food and overall attitude scores on the school lunch questionnaire were significantly higher in the satellite

cafeteria than in the family style food service. Individual item analysis did not determine the source of the difference. The higher percentage of free and reduced price lunches may have contributed to the higher attitude scores and participation rate in the satellite cafeteria school.

More food was served to students in the family style school than in the satellite cafeteria school. It appeared that a greater proportion of the food delivered was served to students in the family style school than in the satellite cafeteria style school. Satellite family style service resulted in less waste and more intake of food compared to satellite cafeteria style service. Food waste tended to be lower and vegetable, salad, and roll intake tended to be higher in satellite family style than in on-site cafeteria style food service.

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Appreciation is expressed to committee members: Dr. Arthur Dayton for the assistance in designing the study and statistical analysis of the data and Dr. Allene Vaden for her school food service study expertise and suggestions during the writing of this thesis. Gratitude is extended to Mrs. Sue Greig, R.D., District Food Service Director, for her help in planning and coordinating the study. The school principals, teachers, students, food service personnel, secretaries, and janitors are acknowledged for their roles in making the data collection possible.

Recognition and appreciation are due to Linda Cain, coordinator of the research for the other part of the study, Diane Dargitz, community practicum student, and the student research teams who worked throughout the data collection. A special note is extended to Eleanor Vilander and Nila Hines for their assistance and moral support and to Julie Govert Walter for word processing.

To my husband, Herb, a special word of thanks is given for his love, patience, encouragement, and faith in me throughout my graduate study. To my children, Mark and Tara, I express appreciation for their love and technical assistance at home which allowed me to devote my time to the study. Grateful appreciation and love is expressed to each member of my family for their support and understanding.

APPENDIXES

APPENDIX A

Approval and Consent

College of Education

Office of the Dean
Bluemont Hall
Manhattan, Kansas 66506
913-532-5525

(KSU letterhead)

September 26, 1983

Dr. James Benjamin
Superintendent of Schools
2031 Poyntz
Manhattan, KS 66502

Dear Dr. Benjamin:

In keeping with the agreement between the Manhattan Public Schools and the College of Education, we have screened the attached proposals by Ms. Becky Lind, Ms. Linda Cain, and Dr. Kathleen Newell to conduct research in the schools, and are forwarding them to you for your action. The proposals have been approved by our Committee on Research Involving Human Subjects and we see no harm arising as a result of the study.

Sincerely yours,

Jordan Utsey, Dean
College of Education

JU:llb

Enclosures (2)

bcc: B. Lind

KANSAS STATE UNIVERSITY

Department of Foods and Nutrition
Justin Hall
Manhattan, Kansas 66506
Phone: 913 532-5508

September 6, 1983

TITLE: Effect of Family Versus Cafeteria Style School Lunch Service on Students' Attitudes and Food Intake

PRINCIPAL INVESTIGATOR: G. Kathleen Newell, Ph.D.
Foods and Nutrition

This proposal has been reviewed and it conforms to University policy and Department of Health, and Human Service regulations (Subpart D 45CFR46). The proposal is recommended for approval for a period of 12 months. If this proposal extends beyond 12 months from its date of approval, the proposal must again be reviewed by the subcommittee. Request for an extension of approval is the responsibility of the principal investigator. Any substantial revision in this study relative to human subjects should be reviewed again by the college subcommittee.

Robert D. Reeves

Robert D. Reeves, Ph.D.
Chairman
Subcommittee on Research Involving Human Subjects

Department of Foods and Nutrition

Justin Hall
Manhattan, Kansas 66506
913-532-5508

(KSU letterhead)

Dear Parent or Guardian and Student:

Your school has been selected to take part in a research study comparing family style and cafeteria style school lunch service. In cooperation with the USD 383 Foodaervice, the Department of Foods and Nutrition at Kansas State University will collect data on student's attitudes, food acceptance and consumption, and daily nutrient intake. The superintendent of your school district, the school principal and the District Foodservice Director have approved the study.

The administration of the school lunch questionnaire and food evaluation will be pilot tested in your school. Selected fourth, fifth, and sixth grade classes will be asked to complete a questionnaire concerning food, foodservice, and lunchroom atmosphere, which will take approximately 20 minutes of classroom time. Selected first, second, and third grade classes will be asked to complete a food evaluation. This will require approximately 15 minutes of classroom time.

Risk to the student will be minimal and involves giving information concerning food likes and dislikes. All information will be kept confidential with responses and data identified by number only. We hope that all students will take part in the study; however participation is voluntary. The student may refuse to participate or discontinue participation at any time with no penalty or loss of benefits to which the student is otherwise entitled.

Data from this study will be useful to the District Director of Foodservice USD 383 and eventually to the students in the district. The information will be helpful to other achool districts in Kansas as well as to other states.

Please indicate your willingness to take part in the study on the back side of this form and return it to the classroom teacher tomorrow or a soon as possible. You may keep the second copy for your record. Parent and student must both give consent before the student can participate in the study. However, if a student is too young to understand this research project, it is not necessary for the student conaent form to be signed. If you have any questions regarding the research please contact Dr. Kathleen Newell (532-5508). Thank you for your cooperation.

Sincerely,

Sue Greig
Sue Greig
District Foodservice Director,
USD 383

Kathleen Newell
Kathleen Newell
Associate Professor,
Dept. of Foods and Nutrition, KSU

Becky Lind
Becky Lind
Graduate Student, KSU

Linda Cain
Linda Cain
Graduate Student, KSU

Department of Foods and Nutrition

Justin Hall
Manhattan, Kansas 66506
913-532-5508

(KSU letterhead)

Dear Parent or Guardian and Student:

Your school has been selected to take part in a research study comparing family style and cafeteria style school lunch service. In cooperation with the USD 383 Foodservice, the Department of Foods and Nutrition at Kansas State University will collect data on student's attitudes, food acceptance and consumption, and daily nutrient intake. The superintendent of your school district, the school principal and the District Foodservice Director have approved the study.

In each selected school the fourth, fifth and sixth grade classes will be asked to complete a questionnaire concerning food, foodservice and lunchroom atmosphere, which will take approximately 20 minutes of classroom time. Plate waste will be measured on four days to determine food consumption of randomly selected students in grades one through six. All students will be asked to complete a food evaluation on each food consumption data collection day. This will require approximately 15 minutes of classroom time each day. Randomly selected fourth, fifth and sixth grade students will be interviewed for recall of one day's diet. The dietary interview will take approximately 20 minutes and involve about 16 students per class.

Risk to the student will be minimal and involves giving information concerning food likes and dislikes. All information will be kept confidential with responses and data identified by number only. We hope that all students will take part in the study; however, participation is voluntary. The student may refuse to participate or discontinue participation at any time with no penalty or loss of benefits to which the student is otherwise entitled.

Data from this study will be useful to the District Director of Foodservice USD 383 and eventually to the students in the district. The information will be helpful to other school districts in Kansas as well as to other states.

Please indicate your willingness to take part in the study on the back side of this form and return it to the classroom teacher tomorrow or as soon as possible. You may keep the second copy for your record. Parent and student must both give consent before the student can participate in the study. However, if the student is too young to understand this research project, it is not necessary for the student consent form to be signed. If you have any questions regarding the research please contact Dr. Kathleen Newell (532-5508). Thank you for your cooperation.

Sincerely,

Sue Greig
Sue Greig
District Foodservice Director,
USD 383

Kathleen Newell
Kathleen Newell
Associate Professor,
Dept. of Foods and Nutrition, KSU

Becky Lind
Becky Lind
Graduate Student, KSU

Linda Cain
Linda Cain
Graduate Student, KSU

Parental Consent

I have read the description of the research study on the front side of this form and:

(please check one)

_____ I give permission for_____to participate in the school
(child's name)
lunch study described on the front side of this form.

_____ I do not give permission for_____to participate in the
(child's name)
school lunch study described on the front side of this form.

_____
(signature of parent or guardian)

_____
(date)

If a student is too young to understand this research project, it is not necessary for the student consent form to be signed.

Student Consent

I have read the description of the research study on the front side of this form and:

(please sign your name after one sentence)

I will take part in this study.

_____ _____
(signature of student) (date)

I will not take part in this study.

_____ _____
(signature of student) (date)

Plesse return one copy of these forms to your teacher tomorrow or as soon as possible. Thank you.

APPENDIX B

Principals' and Teachers' Letters

Department of Foods and Nutrition

Justin Hall
Manhattan, Kansas 66506
913-532-5508

(KSU letterhead)

October 6, 1983

Mr. Doyle Barnes, Principal
Theodore Roosevelt Elementary School
14th and Houston Streets
Manhattan, Kansas 66502

Dear Mr. Barnes:

The problem of excessive food waste in lunch programs has led to numerous investigations of ways to reduce that waste. One strategy that has been employed by school foodservice personnel is variations in serving style. Family style meal service is being used in a few areas of the country, including Theodore Roosevelt School, with reported reduction in food waste, but statistically designed studies with food consumption data are lacking.

In cooperation with Mrs. Sue Greig, District Director of Foodservice, we plan to collect data at Theodore Roosevelt and Lee elementary schools in order to compare the effects of family versus cafeteria style meal service on students' attitudes, food acceptance and consumption, and daily nutrient intake.

Teacher information packets accompany this letter. Instructions, sample forms and a tentative schedule are included. Parent-student information letters and consent forms will need to be distributed and collected in the classroom prior to the study. Parent and student permissions to participate are required for all students involved in the study. However, if a student is too young to understand this research project it is not necessary for the student form to be signed.

For the first part of the study your teachers will be asked to administer a school lunch questionnaire to the fourth, fifth and sixth grade students. This should take less than 20 minutes. A narrative script will be provided to assist with this data collection.

Randomly selected students from grades one through six will participate in the lunchroom plate waste portion of the study. Prior to students coming the lunchroom, we will ask your teachers to read an instruction to the students. The two days of pilot study and four days of data collection will be scheduled on Tuesdays and Thursdays. Researchers will weigh the leftover foods on selected students' plates in the lunchroom area.

In the classroom following the lunch period on the four lunchroom data collection days, your teachers will be asked to give student instructions to grades one through six for completing the food evaluation form. A narratvie script and poster will be provided to assist with the instruction. Completion of the food evaluation form will take about 10 minutes.

The study also includes 24-hour dietary recall interviews to be conducted with 48 randomly selected fourth, fifth and sixth grade students in each school. This will entail a personal interview with individual students on four selected study days. The interviews will be conducted by two trained interviewers and will require approximately 20 minutes of each participating student's time.

The narrative scripts for each student instruction are provided to simplify the teachers role and standardize the data collection procedure. In order to insure confidentiality, an identification number will be assigned from the rosters of participating students for use on all data collection forms. Student forms will be delivered to the office and collected from the office by the researchers on the data collection day.

We wish to express our appreciation in advance for your cooperation.

Sincerely,

Sue Greig
Sue Greig
District Foodservice Director,
USD 383

Becky Lind
Becky Lind
Graduate Student,
Kansas State University

Kathleen Newell
Kathleen Newell
Associate Professor,
Dept. of Foods and Nutrition
Kansas State University

Linda Cain
Linda Cain
Graduate Student,
Kansas State University

Department of Foods and Nutrition

Justin Hall
Manhattan, Kansas 66506
913-532-5508

(KSU letterhead)

November 14, 1983

Dr. Singer
Woodrow Wilson Elementary School
6th and Leavenworth
Manhattan, KS 66502

Dear Dr. Singer:

The problem of excessive food waste in lunch programs has led to numerous investigations of ways to reduce that waste. One strategy that has been employed by school foodservice personnel is variations in serving style. Family style meal service is being used in a few areas of the country, including Theodore Roosevelt School, with reported reduction in food waste, but statistically designed studies with food consumption are lacking.

In cooperation with Mrs. Sue Greig, District Director of Foodservice, we plan to collect data at Theodore Roosevelt and Woodrow Wilson elementary schools in order to compare the effects of family versus cafeteria style meal service on students' attitudes, food acceptance and comsumption, and daily nutrient intake.

Teacher information packets accompany this letter. Instructions, sample forms and a tentative schedule are included. Parent-student information letters and consent forms will need to be distributed and collected in the classroom prior to the study. Parent and student permissions to participate are required for all students involved in the study. However, if a student is too young to understand this research project it is not necessary for the student section to be signed.

For the first part of the study your teachers will be asked to administer a school lunch questionnaire to the fourth, fifth and sixth grade students. This should take less than 20 minutes. A narrative script will be provided to assist with this data collection.

Students from grades one through six will participate in the lunchroom plate waste portion of the study. Prior to students coming to the lunchroom, we will ask your teachers to distribute identification tray cards to selected students and read an instruction to the students. The one day of pilot study and four days of data collection will be scheduled on Tuesdays and Thursdays. Researchers will weigh the left-over foods on selected students' trays in the lnnchroom area.

In the classroom following the lunch period on four lunchroom data collection days, your teachers will be asked to give student instructions to grades one through six for completing the food evaluation form. A narrative script and poster will be provided to assist with this data collection. Completion of the food evaluation form will take about 10 minutes.

The study also includes 24-hour dietary recall interviews to be conducted with 48 randomly selected fourth, fifth and sixth grade students in each school. This will entail a personal interview with individual students on two selected study days. The interviews will be conducted by four trained interviewers and will require approximately 20 minutes of each participating student's time.

The narrative scripts for each student instruction are provided to simplify the teacher's role and standardize the data collection procedure. In order to insure confidentiality, an identification number will be assigned from the rosters of participating students for use on all data collections. Student forms will be delivered to the office and collected from the office by the researchers on the data collection day.

We wish to express our appreciation in advance for your cooperation.

Sincerely,

Sue Greig
District Foodservice Director,
USD 383

Becky Lind
Graduate Student,
Kansas State University

Kathleen Newell
Associate Professor,
Dept. of Foods and Nutrition
Kansas State University

Linda Cain
Graduate Student,
Kansas State University

Department of Foods and Nutrition

Justin Hall
Manhattan, Kansas 66506
913-532-5508

(KSU letterhead)

October 3, 1983

Mrs. Hinnie Smith, Principal
Lee Elementary School
Anderson and Lee Streets
Manhattan, Kansas 66502

Dear Mrs. Smith:

The problem of excessive food waste in lunch programs has led to numerous investigations of ways to reduce that waste. One strategy that has been employed by school foodservice personnel is variations in serving style. Family style meal service is being used in a few areas of the country, including Theodore Roosevelt School, with reported reduction in food waste, but statistically designed studies with food consumption are lacking.

In cooperation with Mrs. Sue Greig, District Director of Foodservice, we plan to collect data at Theodore Roosevelt and Lee elementary schools in order to compare the effects of family versus cafeteria style meal service on students' attitudes, food acceptance and consumption, and daily nutrient intake.

Teacher information packets accompany this letter. Instructions, sample forms and a tentative schedule are included. Parent-student information letters and consent forms will need to be distributed and collected in the classroom prior to the study. Parent and student permissions to participate are required for all students involved in the study. However, if a student is too young to understand this research project it is not necessary for the student form to be signed.

For the first part of the study your teachers will be asked to administer a school lunch questionnaire to the fourth, fifth and sixth grade students. This should take less than 20 minutes. A narrative script will be provided to assist with this data collection.

Students from grades one through six will participate in the lunchroom plate waste portion of the study. Prior to students coming to the lunchroom, we will ask your teachers to distribute identification tray cards to selected students and read an instruction to the students. The two days of pilot study and four days of data collection will be scheduled on Tuesdays and Thursdays. Researchers will weigh the left-over foods on selected students' trays in the lunchroom area.

Mrs. Hinnie Smith
October 3, 1983
Page 2

In the classroom following the lunch period on four lunchroom data collection days, your teachers will be asked to give student instructions to grades one through six for completing the food evaluation form. A narrative script and poster will be provided to assist with this data collection. Completion of the food evaluation form will take about 10 minutes.

The study also includes 24-hour dietary recall interviews to be conducted with 48 randomly selected fourth, fifth and sixth grade students in each school. This will entail a personal interview with individual students on four selected study days. The interviews will be conducted by two trained interviewers and will require approximately 20 minutes of each participating student's time.

The narrative scripts for each student instruction are provided to simplify the researchers role and standardize the data collection procedure. In order to insure confidentiality, an identification number will be assigned from the rosters of participating students for use on all data collections. Student forms will be delivered to the office and collected from the office by the researchers on the data collection day.

We wish to express our appreciation in advance for your cooperation.

Sincerely,

Sue Greig
Sue Greig
District Foodservice Director,
USD 383

Becky Lind
Becky Lind
Graduate Student,
Kansas State University

Kathleen Newell
Kathleen Newell
Associate Professor,
Dept. of Foods and Nutrition
Kansas State University

Linda Cain
Linda Cain
Graduate Student,
Kansas State University

Department of Foods and Nutrition

(KSU letterhead)

Justin Hall
Manhattan, Kansas 66506
913-532-5508

October 4, 1983

(Principal and Teachers)

Marlatt Elementary School
2715 Hobbs Drive
Manhattan, Kansas 66502

The problem of excessive food waste in lunch programs has led to numerous investigations of ways to reduce that waste. One strategy that has been employed by school foodservice personnel is variations in serving style. Family style meal service is being used in a few areas of the country, including Theodore Roosevelt School, with reported reduction in food waste, but statistically designed studies with food comsumption data are lacking.

In cooperation with Mrs. Sue Greig, District Director of Foodservice, we plan to collect data at Theodore Roosevelt and Lee elementary schools in order to compare the effects of family versus cafeteria style meal service on students' attitudes, food acceptance and consumption, and daily nutrient intake.

The administration of the school lunch questionnaire and food evaluation will be pilot tested in your school on Monday, October 10, 1983 to evaluate instructions and procedures. Teacher packets accompany this letter. Instructions and sample forms are included.

Parent-student information letters and consent forms will need to be distributed and collected in the classroom prior to the study. Parent and student permission to participate is required for all students involved in the study. However, if a student is too young to understand this research project it is not necessary for the student form to be signed. The duplicate forms will be distributed in the classroom on Wednesday, October 5, 1983 and are to be taken home by the students. Students are instructed in the letter to return the forms to their teacher tomorrow or as soon as possible. A researcher will pick up the forms on Friday, October 7, 1983 from the principal's office after school.

For the school lunch questionnaire we have asked that one teacher in each of the grades four, five and six administer the questionnaire at their convenience on Monday, October 10, 1983. This should take about 20 minutes to complete. A narrative script will be provided to assist with this data collection.

For the food evaluation we have asked that one teacher in each of the grades one, two and three show the students how to complete a food evaluation form in the classroom immediately following the lunch period on Monday, October 10, 1983. A poster and narrative script will be provided to assist with the instruction. Completion of the food evaluation form will take approximately 10 minutes.

The narrative scripts for each student instruction are provided to simplify the teachers role and standardize the data collection procedure. In order to insure confidentiality, an identification number will be assigned from the rosters of participating students for use on all data collection forms. Student forms will be delivered to the office and collected from the office by the researchers on the data collection day.

The purpose of this pilot study is to evaluate and improve the instructions and procedures; therefore, the teachers comments and suggestions are very important. An evaluation form for this purpose will be enclosed with each set of pilot study materials. Please record the actual number of minutes spent on the distribution, instruction, completion and collection of the forms on Monday, October 10, 1983. Specific questions and problems encountered and suggestions for improvement will be helpful.

We wish to express our appreciation in advance for your cooperation.

Sincerely,

Sue Greig
Sue Greig
District Foodservice Director,
USD 383

Becky Lind
Becky Lind
Graduate Student,
Kansas State University

Kathleen Newell
Kathleen Newell
Associate Professor,
Dept. of Foods and Nutrition,
Kansas State University

Linda Cain
Linda Cain
Graduate Student
Kansas State University

Department of Foods and Nutrition

(KSU letterhead)

Justin Hall
Manhattan, Kansas 66506
913-532-5508

October 6, 1983

(Teachers)

Theodore Roosevelt Elementary School
14th and Houston Streets
Manhattan, Kansas 66502

The problem of excessive food waste in lunch programs has led to numerous investigations of ways to reduce that waste. One strategy that has been employed by school foodservice personnel is variations in serving style. Family style meal service is being used in a few areas of the country, including Theodore Roosevelt School, with reported reduction in food waste, but statistically designed studies with food consumption data are lacking.

In cooperation with Mrs. Sue Greig, District Director of Foodservice, we plan to collect data at Theodore Roosevelt and Lee elementary schools in order to compare the effects of family versus cafeteria style meal service on students' attitudes, food acceptance and consumption, and daily nutrient intake.

Teacher information packets accompany this letter. Instructions, sample forms and a tentative schedule are included. Parent-student information letters and consent forms will need to be distributed and collected in the classroom prior to the study. Parent and student permission to participate is required for all students involved in the study. However, if a student is too young to understand this research project it is not necessary for the student form to be signed.

For the first part of the study you will be asked to administer a school lunch questionnaire to the fourth, fifth and sixth grade students. This should take less than 20 minutes. A narrative script will be provided to assist you with this data collection.

Randomly selected students from grades one through six will participate in the lunchroom plate waste portion of the study. Prior to students coming to the lunchroom, we will ask you to read the instructions to students. The two days of pilot and four days of lunchroom data collection will be scheduled on Tuesdays and Thursdays. Researchers will weigh the leftover foods on selected students' plates in the lunchroom area.

In the classroom following the lunch period on lunchroom data collection days, you will be asked to give student instructions to grades one through six for completing the food evaluation form. A narrative script and poster will be provided to assist you with the inatruction. Completion of the food evaluation form will take about 10 minutes.

The study also includes 24-hour dietary recall interviews to be conducted with 48 randomly selected fourth, fifth and sixth grade students in each school. This will entail a personal interview with individual students on four selected study days. The interviews will be conducted by two trained interviewers and will require approximately 20 minutes of each participating student's time.

The narrative scripts for each student instruction are provided to simplify your role and standardize the data collection procedure. In order to insure confidentiality, an identification number will be assigned from the rosters of participating students for use on all data collection forms. Student forms will be delivered to the office and collected from the office by the researchers on the data collection day.

We wish to express our appreciation in advance for your cooperation.

Sincerely,

Sue Greig
Sue Greig
District Foodservice Director,
USD 383

Becky Lind
Becky Lind
Graduate Student,
Kansas State University

Kathleen Newell
Kathleen Newell
Associate Professor,
Dept. of Foods and Nutrition,
Kansas State University

Linda Cain
Linda Cain
Graduate Student,
Kansas State University

Department of Foods and Nutrition

Justin Hall
Manhattan, Kansas 66506
913-532-5508

(KSU letterhead)

Dear Teachers of Woodrow Wilson School:

The problem of excessive food waste in lunch programs has led to numerous investigations of ways to reduce that waste. One strategy that has been employed by school foodservice personnel is variations in serving style. Family style meal service is being used in a few areas of the country, including Theodore Roosevelt School, with reported reduction in food waste, but statistically designed studies with food consumption data are lacking.

In cooperation with Mrs. Sue Greig, District Director of Foodservice, we plan to collect data at Theodore Roosevelt and Woodrow Wilson Elementary Schools in order to compare the effects of family versus cafeteria style meal service on students' attitudes, food acceptance and consumption, and daily nutrient intake.

Teacher information packets accompany this letter. Instructions, sample forms and a tentative schedule are included. Parent-student information letters and consent forms will need to be distributed and collected in the classroom prior to the study. Parent and student permissions to participate are required for all students involved in the study. However, if a student is too young to understand this research project it is not necessary for the student section to be signed.

For the first part of the study you will be asked to administer a school lunch questionnaire to the 4th, 5th and 6th grade students. This should take less than 20 minutes. A narrative script will be provided to assist you with this data collection.

Students from grades one through six will participate in the lunchroom plate waste portion of the study. Prior to students coming to the lunchroom, we will ask you to distribute identification trey cards to selected students and read a brief instruction to the students. The one day of pilot study and four days of data collection will be scheduled on Tuesdays and Thursdays. Researchers will weigh the left-over foods on selected student's trays in the lunchroom area.

In the classroom following the lunch period on lunchroom data collection days, you will be asked to give student instructions to grades one through six for completing the food evaluation form. A narrative script and poster will be provided to assist you with this data collection. Completion of the food evaluation form will take about 10 minutes.

The study also includes 24-hour dietary recall interviews to be conducted with 48 randomly selected 4th, 5th and 6th grade students in each school. This will entail a personal interview with individual students on two selected study days. The interviews will be conducted by four trained interviewers and will require approximately 20 minutes of each participating student's time.

The narrative scripts for each student instruction are provided to simplify your role and standardize the data collection procedure. In order to insure confidentiality, an identification number will be assigned from the rosters of participating students for use on all data collection forms. Student forms will be delivered to the office and collected from the office by the researchers on the data collection day.

We wish to express our appreciation in advance for your cooperation.

Sincerely,

Sue Greig
District Foodservice Director,
USD 383

Becky Lind
Graduate Student,
Kansas State University

Kathleen Newell
Associate Professor,
Dept. of Foods and Nutrition
Kansas State University

Linda Cain
Graduate Student,
Kansas Stete University

Department of Foods and Nutrition

Justin Hall
Manhattan, Kansas 66506
913-532-5508

(KSU letterhead)

Dear Teachers of Lee School:

The problem of excessive food waste in lunch programs has led to numerous investigations of ways to reduce that waste. One strategy that has been employed by school foodservice personnel is variations in serving style. Family style meal service is being used in a few areas of the country, including Theodore Roosevelt School, with reported reduction in food waste, but statistically designed studies with food consumption data are lacking.

In cooperation with Mrs. Sue Greig, District Director of Foodservice, we plan to collect data at Theodore Roosevelt and Lee Elementary Schools in order to compare the effects of family versus cafeteria style meal service on students' attitudes, food acceptance and consumption, and daily nutrient intake.

Teacher information packets accompany this letter. Instructions, sample forms and a tentative schedule are included. Parent-student information letters and consent forms will need to be distributed and collected in the classroom prior to the study. Parent and student permissions to participate are required for all students involved in the study.

For the first part of the study you will be asked to administer a school lunch questionnaire to the 4th, 5th, and 6th grade students. This should take less than 20 minutes. A narrative script will be provided to assist you with this data collection.

Students from grades one through six will participate in the lunchroom plate waste portion of the study. Prior to students coming to the lunchroom, we will ask you to distribute identification tray cards to selected students and read a brief instruction to the students. The two days of pilot study and four days of data collection will be scheduled on Tuesdays and Thursdays. Researchers will weigh the left-over foods on selected student's trays in the lunchroom area.

In the classroom following the lunch period on lunchroom data collection days, you will be asked to give student instructions to grades one through six for completing the food evaluation form. A narrative script and poster will be provided to assist you with this data collection. Completion of the food evaluation form will take about 10 minutes.

The study also includes 24-hour dietary recall interviews to be conducted with 48 randomly selected 4th, 5th, and 6th grade students in each school. This will entail a personal interview with individual students on four selected study days. The interviews will be conducted by two trained interviewers and will require approximately 20 minutes of each participating student's time.

The narrative scripts for each student instruction are provided to simplify your role and standardize the data collection procedure. In order to insure confidentiality, an identification number will be assigned from the rosters of participating students for use on all data collection forms. Student forms will be delivered to the office and collected from the office by the researchers on the data collection day.

We wish to express our appreciation in advance for your cooperation.

Sincerely,

Sue Greig
District Foodservice Director,
USD 383

Becky Lind
Graduate Student,
Kansas State University

Kathleen Newell
Associate Professor,
Dept. of Foods and Nutrition,
Kansas State University

Linda Cain
Graduate Student,
Kansas State University

APPENDIX C

School Lunch Questionnaire

Department of Foods and Nutrition

Kansas State University

TO: Teachers of fourth, fifth and sixth grades in participating schools

FROM: Becky A. Lind
Linda Cain
Graduate Students
Kansas State University

G. Kathleen Newell, Ph.D., R.D.
Project Director and Associate
Professor of Foods and Nutrition
Kansas State University

SUBJECT: Introduction of the study and administration of the School Lunch Questionnaire

Please read the following explanation in introducing the study to the students. It is important that all students receive the same basic information. Please wait for students to complete each part on page one before reading instructions for the next part as indicated in the narrative.

" The Department of Foods and Nutrition at Kansas State University, in cooperation with the USD 383 Foodservice, is studying the effect of the type of meal service on food consumption and school lunch attitudes. Mrs. Greig, School Foodservice Director has approved the study. The researchers have provided a questionnaire for each student who consented and has parent permission to participate in the study. They hope you will be willing to help them by filling out the questionnaire today, but if you do not wish to do so you may turn in your questionnaire blank. You may remove your name tab to assure your answers will be kept confidential. Please answer questions as instructed on the questionnaire. Lay down your pencil when Part I is finished. Start now with Part I only. (wait for students to complete Part I) Part II on the first page requires you to answer only one question which applies to you. Answer only question #1 if you usually eat school lunch, answer only question #2 if you usually eat lunch at home and answer only question #3 if you usually bring a sack lunch. You may check as many of the responses as are correct for you in the one question you answer now. (wait for students to complete Part II) Part III and IV on page two requires only one answer to each question. When you have completed the questionnaire, please turn it over. When everyone is finished the questionnaires will be collected. The Department of Foods and Nutrition and the researchers appreciate your help with the study."

Please place completed questionnaires in the envelope provided which is marked for your class and return them to the school office. Thank you for your assistance.

SCHOOL LUNCH QUESTIONNAIRE

I.D. NUMBER _____ DATE _____

PART I: Read each question carefully. Then select your answer and check in the space provided.

1. I am a:

_____ A. Boy.
_____ B. Girl.

2. I am in the:

_____ A. 4th grade.
_____ B. 5th grade.
_____ C. 6th grade.

3. I usually:

_____ A. Eat school lunch each day.
_____ B. Eat school lunch 3 or 4 times a week.
_____ C. Eat school lunch 1 or 2 times a week.
_____ D. Eat school lunch less than once a week.
_____ E. I never eat the school lunch.

PART II: Answer only the ONE question (1, 2, or 3) which applies to you.

1. If you USUALLY EAT SCHOOL LUNCH 3 or more times a week, check as many of the following as you feel are correct for you.

_____ A. I usually like the food that is served.
_____ B. My friends eat the school lunch.
_____ C. I like to eat the school lunch.
_____ D. My parents want me to eat the school lunch.
_____ E. It's cheaper to eat the school lunch.

2. If you USUALLY EAT LUNCH AT HOME, check as many cf the following as you feel are correct for you.

_____ A. I don't like the food served at school.
_____ B. My friends don't eat at school.
_____ C. I like eating at home.
_____ D. My parents want me to come home for lunch.
_____ E. It's cheaper to eat at home.

3. If you USUALLY BRING A SACK LUNCH, check as many of the following as you feel are correct for you.

_____ A. I don't like the food served at school.
_____ B. My friends bring sack lunches.
_____ C. I like sack lunches.
_____ D. My parents want me to bring a sack lunch.
_____ E. It's cheaper to bring a sack lunch.

PART III: If you have eaten THE SCHOOL LUNCH OR A SACK LUNCH this school year, please answer the following questions. Check only one answer to each question.

1. I sit by a friend at lunch:
   ____ A. Most of the time.
   ____ B. Some of the time.
   ____ C. Not at all.

2. The lunchroom is cheerful:
   ____ A. Yes, very cheerful.
   ____ B. Somewhat cheerful.
   ____ C. Not very cheerful.

3. I enjoy eating in the lunchroom:
   ____ A. Most of the time.
   ____ B. Some of the time.
   ____ C. Hardly ever.

4. The lunchroom supervisors are:
   ____ A. Usually friendly.
   ____ B. Sometimes friendly.
   ____ C. Often crabby.

5. The lunchroom is clean:
   ____ A. Most of the time.
   ____ B. I don't really notice.
   ____ C. Some of the time.

6. I like to eat with the students who sit with me at lunch:
   ____ A. Usually.
   ____ B. Sometimes.
   ____ C. Not at all.

7. The lunchroom is too noisy:
   ____ A. Most of the time.
   ____ B. Some of the time.
   ____ C. The noise doesn't bother me.

8. The cooks are:
   ____ A. Usually friendly.
   ____ B. Sometimes friendly.
   ____ C. Often crabby.

9. We are rushed during lunch:
   ____ A. Most of the time.
   ____ B. Some of the time.
   ____ C. Not at all.

10. We have to be quiet during lunch:
    ____ A. Most of the time.
    ____ B. Some of the time.
    ____ C. Usually not restricted.

11. I believe I should eat:
    ____ A. All of my food.
    ____ B. At least some of each food.
    ____ C. Only what I want to eat.

12. The supervisors or others in the lunchroom:
    ____ A. Usually encourage me to eat.
    ____ B. Sometimes encourage me to eat.
    ____ C. Don't say anything about what I eat.

PART IV: If you have eaten THE SCHOOL LUNCH this school year, please answer the following questions. Check only one answer to each question.

1. The food in the school lunch is.
   ____ A. Almost always good.
   ____ B. Good some of the time.
   ____ C. Usually not very good.

2. I like the meat dishes:
   ____ A. Most of the time.
   ____ B. Some of the time.
   ____ C. Not very often.

3. I like the vegetables:
   ____ A. Most of the time.
   ____ B. Some of the time.
   ____ C. Not very often.

4. I like the desserts:
   ____ A. Most of the time.
   ____ B. Some of the time.
   ____ C. Not very often.

5. When I eat school lunch I usually:
   ____ A. Eat most of my food.
   ____ B. Eat about half of my food.
   ____ C. Leave a lot of my food.

6. The hot foods (like meats and vegetables) are:
   ____ A. Usually hot enough.
   ____ B. Sometimes only warm.
   ____ C. Often cold.

7. The cold foods (like salads and fruits) are:
   ____ A. Usually cold.
   ____ B. Sometimes cold.
   ____ C. Often not cold enough.

8. The amount of food on my plate is about right:
   ____ A. Most of the time.
   ____ B. Some of the time.
   ____ C. I don't get enough to eat.

ATTITUDE SCORE

PART III: If you have eaten THE SCHOOL LUNCH OR A SACK LUNCH this school year, please answer the following questions. Check only one answer to each question.

1. I sit by a friend at lunch:
   _____ A. Most of the time.
   _____ B. Some of the time.
   _____ C. Not at all.

2. The lunchroom is cheerful:
   3 _____ A. Yes, very cheerful.
   2 _____ B. Somewhat cheerful.
   1 _____ C. Not very cheerful.

3. I enjoy eating in the lunchroom:
   3 _____ A. Most of the time.
   2 _____ B. Some of the time.
   1 _____ C. Hardly ever.

4. The lunchroom supervisors are:
   3 _____ A. Usually friendly.
   2 _____ B. Sometimes friendly.
   1 _____ C. Often crabby.

5. The lunchroom is clean:
   3 _____ A. Most of the time.
   2 _____ B. I don't really notice.
   1 _____ C. Some of the time.

6. I like to eat with the students who sit with me at lunch:
   _____ A. Usually.
   _____ B. Sometimes.
   _____ C. Not at all.

7. The lunchroom is too noisy:
   1 _____ A. Most of the time.
   2 _____ B. Some of the time.
   3 _____ C. The noise doesn't bother me.

8. The cooks are:
   3 _____ A. Usually friendly.
   2 _____ B. Sometimes friendly.
   1 _____ C. Often crabby.

9. We are rushed during lunch:
   1 _____ A. Most of the time.
   2 _____ B. Some of the time.
   3 _____ C. Not at all.

10. We have to be quiet during lunch:
   _____ A. Most of the time.
   _____ B. Some of the time.
   _____ C. Usually not restricted.

11. I believe I should eat:
   _____ A. All of my food.
   _____ B. At least some of each food.
   _____ C. Only what I want to eat.

12. The supervisors or others in the lunchroom:
   _____ A. Usually encourage me to eat.
   _____ B. Sometimes encourage me to eat.
   _____ C. Don't say anything about what I eat.

PART IV: If you have eaten THE SCHOOL LUNCH this school year, please answer the following questions. Check only one answer to each question.

1. The food in the school lunch is:
   3 _____ A. Almost always good.
   2 _____ B. Good some of the time.
   1 _____ C. Usually not very good.

2. I like the meat dishes:
   3 _____ A. Most of the time.
   2 _____ B. Some of the time.
   1 _____ C. Not very often.

3. I like the vegetables:
   3 _____ A. Most of the time.
   2 _____ B. Some of the time.
   1 _____ C. Not very often.

4. I like the desserts:
   3 _____ A. Most of the time.
   2 _____ B. Some of the time.
   1 _____ C. Not very often.

5. When I eat school lunch I usually:
   3 _____ A. Eat most of my food.
   2 _____ B. Eat about half of my food.
   1 _____ C. Leave a lot of my food.

6. The hot foods (like meats and vegetables) are:
   3
   2 _____ A. Usually hot enough.
   1 _____ B. Sometimes only warm.
   _____ C. Often cold.

7. The cold foods (like salads and fruits) are:
   3
   2 _____ A. Usually cold.
   1 _____ B. Sometimes cold.
   _____ C. Often not cold enough.

8. The amount of food on my plate is about right:
   3
   2 _____ A. Most of the time.
   1 _____ B. Some of the time.
   _____ C. I don't get enough to eat.

Comments and Suggestions for Improvement

of the School Lunch Questionnaire

1. How much class time did you spend on the Questionnaire? _____ minutes

2. Were the teachers' instructions for the Questionnaire easy to understand?

_____ yes _____ no Comments: _____

_____

_____

3. Were the narrative instructions to the students easy to present?

_____ yes _____ no Comments: _____

_____

_____

4. Were the narrative instructions clear to the students?

_____ yes _____ no Comments: _____

_____

_____

_____

5. Any other suggestions or comments concerning procedures or materials would be helpful to us. _____

_____

_____

_____

_____

Thank you for your time and comments which will enable us to improve the study.

APPENDIX D

Family Style Food Service

Department of Foods and Nutrition
Kansas State University

To: Teachers in Theodore Roosevelt School

From: Becky Lind
Linda Cain
Graduate Students
Kansas State University

Kathleen Newell, Ph.D., R.D.,
Project Director and Associate
Professor of Foods and Nutrition

Subject: Lunchroom data collection for the school foodservice study.

Please read the following explanation before lunch today to put the students at ease and make the data collection proceed with as little disruption as possible.

> "Today students who have colored name cards on their tables will be part of the school foodservice study. The host and hostess at the color marked tables must have their serving dishes of food weighed before taking them to their tables. Please place your name card by your meal while you eat. After you have finished eating, if you were seated at the numbered tables without name cards take your plates to the regular plate deposit window. If you ate a cold lunch, take your waste to the trash can at the window. If you ate a hot lunch and have a name card place your name card and your milk carton <u>on</u> your plate and take your plate to the research plate collection table. Put your silver in the dishpan and napkin in the wastebasket. Your name card and milk carton must be left on your plate at the table for the researchers even if there is no milk or food left on your plate. Thank you for your cooperation in the study."

The enclosed Food Evaluation forms should be completed by the students immediately following lunch. Thank you for your help with the study.

FAMILY STYLE FOOD SERVICE DATA COLLECTION PROCEDURES

PRELIMINARY WORK--research coordinator

1. Weigh plastic waste collection containers with lids, adding weights so that each container and lid weighs 127 grams. Tape weights to lids to avoid loss during repeated washing of containers.

2. Record first names, grade, and sex of students at each table.

3. Prepare materials for research station clip boards.
   * Enter student ID (or grade and sex if students are not study participants) and table color and number on the Student Participation by Tables form.
   * Prepare signs for tables and waste collection area.
   * Prepare table number labels for passed and removed containers and package in envelopes.
   * Prepare Containers of Food in Grams forms.

4. Check names of students seated at each table on Monday of each study week and make corrections as needed.

5. Weigh a random sample of five food containers of each type (bowls, platters, plates) to be used on study days to determine standard container weights.

PREPARATION ON DATA COLLECTION DAY--research coordinator

1. Deliver lunchroom data collection instructions to the principal's office for distribution to teachers before the beginning of the school day.

2. Deliver equipment to the school.
   * Arrange equipment on research station carts.
   * Set up waste collection tables.
   * Check equipment lists and clip boards.
   * Calibrate all spring and balance scales using 5, 20, and 200 gm weights.

3. Meet with food service manager.
   * Discuss any problem areas.
   * Check on serving containers to be used for each item.

4. Brief lunchroom supervisors on procedures.
   * Remind them that all bowls removed or passed must be weighed.
   * Ask them to take a table number label for each bowl removed to verify its origin.
   * Remind them that containers to be passed should have weights recorded on the label and should accompany the container to eliminate reweighing when added to another station's table.

FAMILY STYLE FOOD SERVICE DATA COLLECTION PROCEDURES (CONT.)

DATA COLLECTION

Research Stations--four assistants

Table assignments:		
	1, 2, and 3	Research assistant 1
	4, 5, and 6	Research assistant 2
	7, 8, and 9	Research assistant 3
	10, 11, and 12	Research assistant 4

1. Locate your tables and position your research station cart according to the Arrangement of Family Style Lunchroom Data Collection.

2. Place name tags and table signs in the centers of the tables.
   * Ask students to place name tags near their place at the table.
   * Make name tags for students without name tags.

3. Place a check (✓) in appropriate columns on student participation forms.
   * Students without name tags should be recorded by name, grade, and sex.
   * Record grade and sex only if names are not voluntarily given (i.e. 6B).
   * Collect name tags of students with sack lunches.

4. Weigh all food containers before delivery to the tables by hosts and record weights on the Containers of Food in Grams form.

5. Check carefully the number of plates and milk of school lunch students and see that totals per table agree with the number recorded on the Student Participation by Tables form.

6. Weigh all food containers removed from or added to any of your three tables.
   * Watch as supervisors serve other tables or return containers to the dish deposit as all containers must be weighed and recorded by table upon removal from or addition to a table.
   * Remove serving utinsils before weighing.

7. After recording weights of all serving containers from all three tables, check to see that students take name cards, plates, and milk cartons to the research waste collection area. Students with sack lunches and students at tables 13, 14 and 15 deliver their plates, silverware, and waste to the kitchen dish deposit.

8. Assist in plate scraping if needed.
   * Name cards must be matched by color and number to the waste collection signs.
   * Transfer food waste from students' plates by item into the plastic containers for waste from each table.

FAMILY STYLE FOOD SERVICE DATA COLLECTION PROCEDURES (CONT.)

9. Repeat for session II.

10. Return all equipment to the hall after session II so that the room can be cleaned for gym.

11. Complete time cards.

Waste Collection--research coordinator

1. Assist students at waste collection area in placing:
   * Napkins in waste baskets.
   * Flatware in dish pan.
   * Milk carton, name cards, and plates on waste collection table.

2. Waste collection:
   * Place name cards in small boxes in front of the six waste containers with matched number signs.
   * Empty milk into milk waste container and discard cartons.
   * Scrape each food item from the plates into the appropriate waste containers using a ruber scraper.
   * Stack plates for return to the dish deposit.
   * Repeat until all waste is collected.

3. Weigh waste:
   * Indicate item with no waste by a dash (-) on the Plate Waste by Tables in Grams form.
   * Weigh each container of waste with lid and record on the Plate Waste Table in Grams form.
   * Divide items weighing over 1000 grams into 2 containers and record both weights.
   * Discard waste in waste baskets.
   * Repeat the procedure for all items for one table.
   * Repeat procedure for all tables.

4. Repeat steps one and two for period II.

5. Remove all equipment to the hall and complete weighing of waste.

6. Check with food service manager to resolve any problems.

7. Clean up and pack equipment for return to Justin Hall.

FAMILY STYLE FOOD SERVICE DATA COLLECTION PROCEDURES (CONT.)

Kitchen Dish Deposit Checker--research assistant

1. Check at the kitchen dish deposit and direct all students from study tables to take their name cards, milk cartons and plates to waste collection area.

2. Record weights of food waste in containers for the research coordinator.

Floater--one research assistant

1. Assist at research stations during weighing of served food to speed delivery of food to tables.

2. Assist students at the waste collection area in placing:
   * Napkins in waste baskets.
   * Flatware in dish pan.
   * Milk carton, name cards, and plates on the waste collection area.

3. Assist research coordinator with plate scraping after all plates are collected.

FAMILY STYLE DATA COLLECTION RESEARCH EQUIPMENT

Research Stations

1, three-shelved wheeled utility cart
1 1,000 gm Hanson spring scale[1]
1 2000 gm Ohaus balance scale[2]
1 rubber spatula
1 dish towl
1 clip board and pen
- 6 name tag packets
- 3 table signs
- 45 removed container table number labels (15/table)
- 4 forms
  - Equipment Arrangement
  - Researcher Responsibilities
  - Student Participation by Tables (1 per session = 2)
  - Containers of Food in Grams (1 per table = 6)

Waste Collection

3, 72" x 42" Tables
72, 1/2 gal. plastic containers with lids (127 gms each)
24 name tag collection boxes
12 signs: color and number matched to tables
8 waste baskets with liners
1 1,000 gm Hanson spring scale
3 weights: 5, 20, and 200 gm.
1 clip board and pen
- 3 forms
  - Equipment Arrangement
  - Researcher Responsibilities
  - Plate Waste By Tables in Grams

[1] Hanson Dietetic Scale, Model 1440, Shibuta Mississippi.
[2] Series 2000, 2610 gm, Ohaus Scale Corporation, 29 Hanover Road, Florham Park, New Jersey 07932.

ARRANGEMENT FOR FAMILY STYLE LUNCHROOM DATA COLLECTION

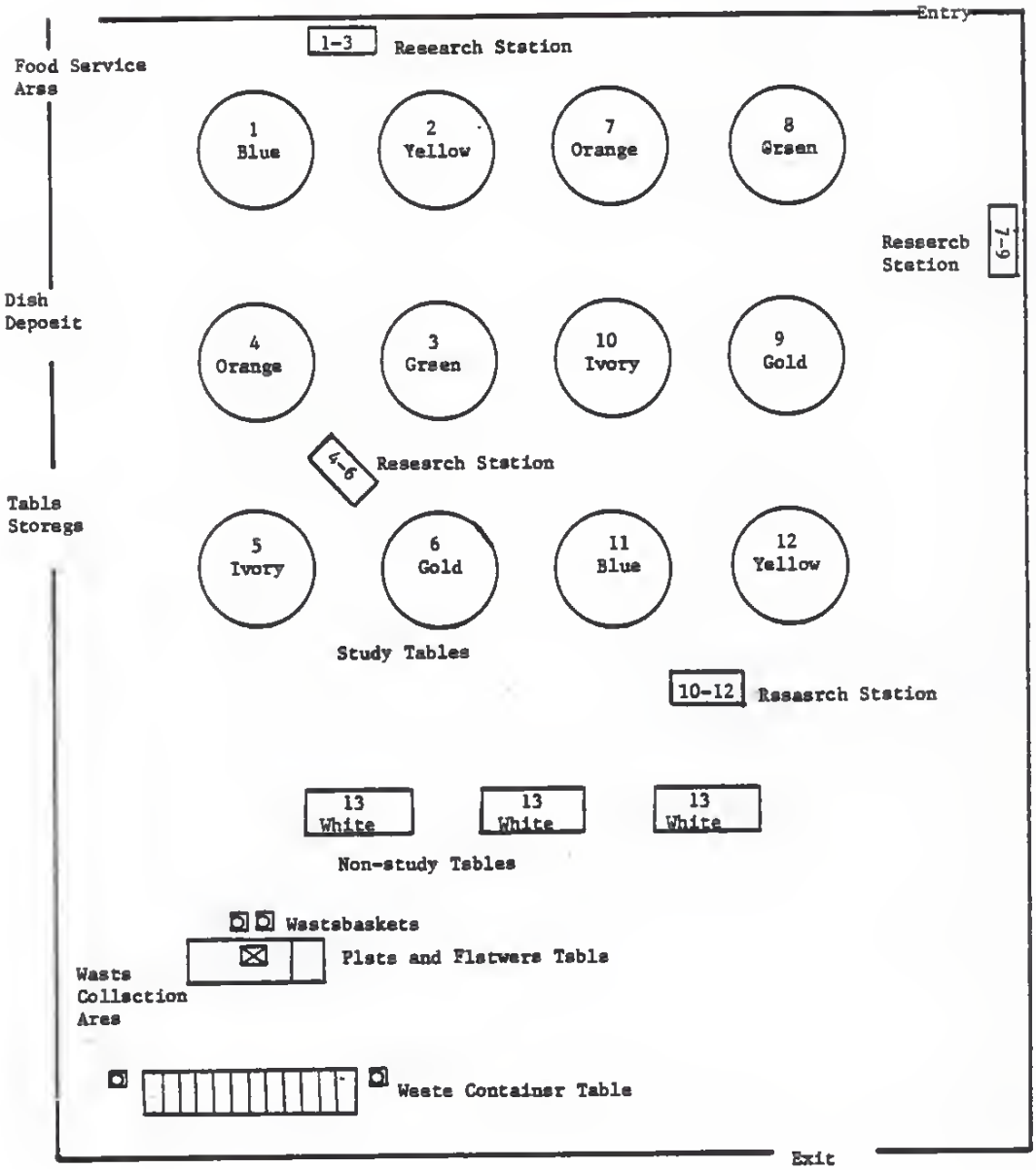


TABLE SIGNS AND NAME CARDS FOR FAMILY STYLE SERVICE

Study table signs, student name cards and Containers of Food in Grams forms were color and number matched for each of the 12 tables. Non-study table signs and name cards were all white for easy identification.

STUDY TABLES (1-12)

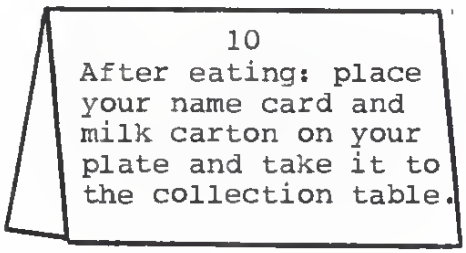
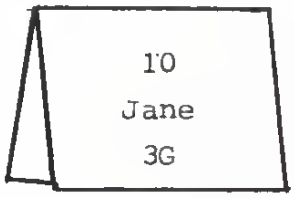


Table Sign
(8" x 11" folded)



Name Card
(3" x 3" folded)

NON-STUDY TABLES (13-15)

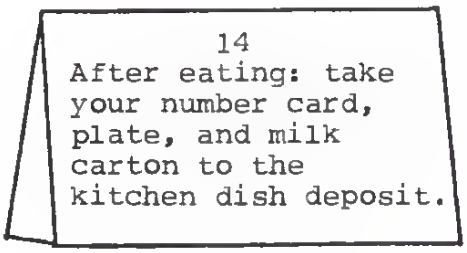
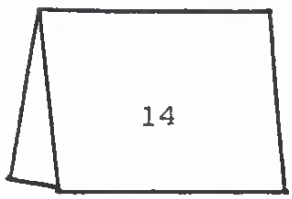


Table Sign
(8" x 11" folded)



Number Card
(3" x 3" folded)

Student Participation by Tables

Date ________________

Research assistant ____________________

School Theodore Roosevelt

Type of Service Family Style

Serving Period ____________

table	name	student ID#	absent	school lunch	sack lunch	milk

Containers of Food in Grams

Served, Passed and Remaining at Study Tables

Date _____ School Theodore Roosevelt

Research Assistant _____ Type of Service Family Style

Table Number _____ Serving Period _____

containers of food served to study tables					
main dish	vegetable	salad	dessert	roll	milk
containers of food added to study tables					
containers of food removed from study tables					

Plate Waste by Tables in Grams

Date _____ School Theodore Roosevelt

Research Assistant _____ Type of Service Family Style

Serving Period _____

table		plate waste by table					
number	color	milk	roll	main dish	vegetable	salad	dessert
1	Blue						
2	Yellow						
3	Green						
4	Orange						
5	Ivory						
6	Gold						
7	Orange						
8	Green						
9	Gold						
10	Ivory						
11	Blue						
12	Yellow						

APPENDIX E

Cafeteria Style Food Service

Department of Foods and Nutrition

Kansas State University

TO: Teachers of Woodrow Wilson School

FROM: Linda Cain
Becky Lind
Graduate Research Assistants

G. Kathleen Newell, Ph.D., R.D.
Project Director and Associate
Professor of Foods and Nutrition
Kansas State University

SUBJECT: Introduction to the study and instructions for data collection day for the school lunch study.

Name tags are enclosed for randomly selected students who have permission and have agreed to participate in the study. Please distribute the name tags just before lunch today. Then read the following explanation on the data collection days to put the students at ease and make the data collection proceed with as little disruption as possible.

" The Department of Foods and Nutrition at Kansas State University, in cooperation with the USD 383 Foodservice, is studying the effect of type of meal service on food consumption. Today randomly selected students who are eating school lunch will be part of the study. Students without name tags will follow the normal lunchroom procedures. Students who eat sack lunches will place their name tags in a box near their waste collection area. Students with name tags who will eat school lunch should place the card with their name facing up in the silverware section of their tray. Please do not give away your milk or trade food today. After you have finished eating, take your tray to the special waste collection area. Leave your milk carton on your tray. Place your silver in the containers on the table and paper in the wastebasket. Leave your tray with your colored name tag and milk carton at the special waste collection tables. The researchers appreciate your cooperation in the study."

Department of Foods and Nutrition

Kansas State University

TO: Teachers

FROM: Linda Cain
Becky Lind
Graduate Research Assistants

G. Kathleen Newell, Ph.D., R.D.
Project Director and Associate
Professor of Foods and Nutrition
Kansas State University

SUBJECT: Introduction to the study and instructions for data collection day for the school lunch study.

Name tags are enclosed for randomly selected students who have permission and have agreed to participate in the study. Please distribute the name tags just before lunch today. Then read the following explanation on the data collection days to put the students at ease and make the data collection proceed with as little disruption as possible.

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CAFETERIA STYLE FOOD SERVICE DATA COLLECTION PROCEDURES

PRELIMINARY PROCEDURES--research coordinator

1. Package name tags and instructions for delivery to classroom teachers.
2. Prepare materials for researchers' clipboards.

PREPARATION ON DATA COLLECTION DAY--research coordinator

1. Deliver lunchroom data collection instructions to the principal's office for distribution to teachers before the beginning of the school day.

2. Order 30 additional lunches without milk before 9:00 a.m. for determination of average portion sizes.

3. Deliver equipment to the school by 11:30 a.m.
   * Notify the principal and food service manager of your arrival.
   * Set up tables and equipment according to the diagram.
   * Calibrate scales with 10 and 50 gram weights.

AVERAGE PORTION SIZES DATA COLLECTION--one research assistant

1. Assemble equipment in the work area.
   * 1 Standard Food Portions in Grams form.
   * 2 rubber scrapers
   * 150 paper plates
   * 1 towel
   * 1 dish cloth
   * 1 small waste basket
   * 5 food containers
   * 1 clipboard and pen

2. Tare scale for an empty paper plate.

3. Randomly select served trays by entering the serving line.
   * Select 5 trays from each grade.
   * Observe color of student identification cards to determine grade level changes.

Grade	1 - blue	4 - green
	2 - yellow	5 - gold
	3 - orange	6 - ivory

4. Scrape each food item from each tray on to a clean paper plate, weigh, and record weight to the nearest gram.
   * Transfer weighed foods to food containers.
   * Discard paper plates.
   * Stack trays and return them to the dish deposit area.

5. Clean up the area.

CAFETERIA STYLE FOOD SERVICE DATA COLLECTION PROCEDURES (CONT.)

WASTE DATA COLLECTION

Tray Waste Collection--one research assistant

1. Assemble equipment in the work area.
   * Student instruction guide.
   * 2 containers for silverware

2. Assist students in placing:
   * Napkins in wastebaskets.
   * Silverware in containers
   * Milk cartons and name tags on trays at the waste collection area.

Plate Waste Scraper--two research assistants

1. Assemble equipment in the work area.
   * 2 rubber scrapers
   * 400 paper plates
   * 3 wet dish clothes
   * 1 towel

2. Scrape each food item from each tray onto a clean paper plate, in the same order as listed on the recording form. Wipe the scraper on the damp dish cloth as needed between items.

3. Place the student name card, milk carton, and plates of food waste for the convenience of the weigher.

Plate Waste Weigher--two research assistants

1. Assemble equipment in the work area.
   * 1 scale
   * 2 wastebaskets

2. Tare scale for an empty paper plate.

3. Weigh plate waste.
   * Place milk carton on the recorder's scale
   * Pass name tag to the recorder
   * Weigh the food waste items individually and read the item name and weights to the recorder.
   * Discard food waste.
   * Repeat procedure for all participating students.

4. Assist with cleanup.

CAFETERIA STYLE FOOD SERVICE DATA COLLECTION PROCEDURES (CONT.)

Assistant Plate Waste Recorder--two research assistants

1. Assemble equipment in the work area.
   * Individual Student Plate Waste in Grams form
   * 1, 500 gram Hanson scale[1]
   * 1 box for tray cards
   * 2 wastebaskets
   * 1 clipboard and pen

2. Tare scale for an empty milk carton.

3. Record data on the Individual Student Plate Waste in Grams form.
   * Record tray card number.
   * Record the milk weight. Record the number of milk cartons if more than one. Record a zero (0) if carton is empty or a dash (-) if student did not take milk.
   * Discard cartons.
   * Record food waste weights of individual items. Record dash (-) if none is left.
   * Repeat for all participating students.

4. Assist with clean up.

[1] Hanson Dietetic Scale, Model 1440, Shibuta, Mississippi.

Standard Food Portions in Grams

Date _____ School _____

Research assistant _____ Type of Service Cafeteria

		gram weights of food portions				
grade	tray number	roll	main dish	vegetable	salad	dessert
1	1					
	2					
	3					
	4					
	5					
2	1					
	2					
	3					
	4					
	5					
3	1					
	2					
	3					
	4					
	5					
4	1					
	2					
	3					
	4					
	5					
5	1					
	2					
	3					
	4					
	5					
6	1					
	2					
	3					
	4					
	5					

Individual Student Plate Waste in Grams

Date ______________________ School ______________________

Researcn assistant ______________________ Type of Service ___Cafeteria___

Recorder ______________________

student	student plate waste					
ID#	milk	roll	main dish	vegetable	salad	dessert

EFFECT OF FAMILY VERSUS CAFETERIA STYLE SCHOOL LUNCH SERVICE ON STUDENTS' ATTITUDES AND FOOD SERVED, WASTED, AND CONSUMED

By

BECKY A. LIND

B.S., University of Nebraska, 1966

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Foods and Nutrition

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1984

ABSTRACT

The Omnibus Reconciliation Act of 1981 authorized the extension of the "offer versus serve" option in elementary schools. As a result, variations in serving style have been implemented in some elementary schools.

Family style service has been reported to increase participation rates and decrease food waste.

The objectives of this research were to compare students' attitudes, food waste, and food intake in schools with family and cafeteria style food service. The study was conducted at three elementary schools: one with family style, satellite food delivery; one with cafeteria style, satellite food delivery; and one with cafeteria style, on-site food preparation.

Initially, a school lunch questionnaire was administered to fourth, fifth, and sixth grade students to study students' attitudes. Lunchroom data were collected on weights of food served and bowl and plate waste of students in grades one through six who ate lunch at tables in the family style service. At schools with cafeteria style service, weights of standard portion sizes were determined and waste data were collected on individual students. Experimental table units were created artificially at cafeteria schools by randomly selecting students to match the compostion of the table in the family style service. Served, waste, and intake of food were calculated and expressed as grams and percentage means of served food per student.

The students' food and overall attitude scores on the school

lunch questionnaire were significantly higher in the satellite cafeteria than in the family style food service. Individual item analysis did not determine the source of the difference.

More food was served to students in the family style school than in the satellite cafeteria school. It appeared that a greater proportion of the food delivered was served to students in the family style school than in the satellite cafeteria style school. Satellite family style service resulted in less waste and more intake of food compared to satellite cafeteria style service. Food waste tended to be lower and vegetable, salad, and roll intake tended to be higher in satellite family style than in on-site cafeteria style food service.