The Journal of Child Nutrition & Management is a refereed journal designed to disseminate research findings and other relevant information applicable to school foodservice in the areas of foodservice facilities, food quality and production, management, program evaluation, nutrition standards, and nutrition education.

Contents include papers on original research, both basic and applied, articles on current topics and issues, abstracts, book reviews, annotated bibliographies on selected topics, and management information data on child nutrition programs. Letters to the editor or relevant commentary on previously published papers or current issues in school foodservice also will be published.

Publisher
Barbara S. Borschow, CAE
American School Food Service Association

Editor
Jeanie Sneed, PhD, RD, SFNS
Hotel, Restaurant and Institution Management
Iowa State University

Managing Editor
Jennifer Boisvert
American School Food Service Association

Senior Editor
Patricia L. Fitzgerald
American School Food Service Association

Associate Editor
Anne Burgett
American School Food Service Association

Graphic Designer
Cher N. Williams
CW Design

Staff Vice President, Communications
Maren Robertson
American School Food Service Association

The Journal of Child Nutrition & Management Advisory Board

Nadine L. Menn, PhD, RD
Chair
Assistant Director
School Foodservice Programs
East Baton Rouge Parish
Baton Rouge, Louisiana

Barbara A. Almanza
Associate Professor
Purdue University
West Lafayette, Indiana

Martha Conklin, PhD, RD
Director of Applied Research
National Food Service
Management Institute
University of Southern Mississippi
Hattiesburg, Mississippi

Beth Egan, M.Ed, RD, SFNS
Instructor
Penn State University
University Park, Pennsylvania

Lora E. Gilbert, MS, RD, LD
Corporate Dietitian
Schwan’s Food Service
Salina, Kansas

Kathleen McGinn
Director
St. Lucie County Schools
Stuart, Florida

Jean Nachmani
Coordinator
Dietetic Services, Food Service Division, Philadelphia School District
Philadelphia, Pennsylvania

Copyright 2001 by the American School Food Service Association (ASFSA). Third class postage paid at Alexandria, Va. The Journal of Child Nutrition & Management is published by ASFSA. Neither ASFSA nor the editor assumes responsibility for the opinions expressed by authors of papers abstracted, quoted, or published in full in The Journal of Child Nutrition & Management. Subscription Rate: U.S.: $25 per year (members and libraries) and $29 per year (nonmembers); Canada: $30.50; all other foreign countries: $40; single copies of current issues: $19.50. Address all correspondence concerning subscriptions, change of address and requests for additional copies to The Journal of Child Nutrition & Management Subscriptions, ASFSA, 700 S. Washington Street, Suite 300, Alexandria, VA 22314; (800) 877-8622.

Manuscripts and Editorial Correspondence: Address all manuscripts and editorial correspondence to Jeanie Sneed, PhD, RD, SFNS, Editor, The Journal of Child Nutrition & Management, Iowa State University, Hotel, Restaurant and Institution Management, 11 MacKay Hall, Ames, IA 50011-1120, (515) 294-8474, FAX: (515) 294-8551; E-mail: jsneed@iastate.edu.
These are exciting times for child nutrition programs. The federal government is funding successful pilot breakfast programs and states also are funding successful breakfast programs. Yet, money and labor shortages continue to challenge school foodservice directors. Some school administrators maintain competitive food policies that place profit over children’s health. We have made major accomplishments—SNDA-II results indicate that 91% of elementary schools meet the Dietary Guidelines for Americans for fat. We have many goals to accomplish, including the ability to provide a school nutrition environment that supports children’s health and well-being.

Fortunately, research provides us with valuable information to facilitate decisionmaking, and provides evidence about the effectiveness of child nutrition programs. The articles in this issue of The Journal of Child Nutrition & Management provide timely and relevant insights into many of these issues. For example, Griffith, Sackin, and Bierbauer discuss many of the benefits and challenges of school meal programs. This article, originally presented as a White Paper at the National Nutrition Summit in May 2000, provides food for thought for operators, educators, and researchers. In addition, Endahl et al. has compiled a summary of the research being conducted by the U.S. Department of Agriculture’s Food and Nutrition Service, including findings of the recent SNDA-II study.

Other articles address nutrition and operation issues. Related to nutrition, Shanley, Thompson, and Fiore conducted research in Connecticut to determine foodservice directors’ perceptions of children’s food preferences, and 4th- and 7th-grade children's preferences. Based on these findings, a four-week cycle menu was developed. Rainville looked at the nutritional quality of reimbursable school meals served to elementary students compared to lunches brought from home. School meals clearly won because they were better able to meet dietary recommendations for fat, calcium, vitamin A, and iron, and included a greater variety of food items. In other research, Bordi, Lambert, and Borja determined the acceptability of lower-fat desserts by 5th graders. These children preferred the lower-fat desserts compared to the higher-fat desserts.

On the other hand, food safety and HACCP implementation continues to be important to school foodservice. Hwang, Almanza, and Nelson surveyed school foodservice managers/directors in Indiana to determine factors that influenced their plans to implement HACCP programs. They found that HACCP programs are most likely to be started in large school districts in which the directors are certified in food safety.

Financial issues also remain critical for school foodservice. March and Gould identified indicators of financial self-sufficiency in Kansas child nutrition programs. Significant predictors included labor cost, government reimbursement, student payments for reimbursable meals, and other income as percents of
revenue. Operators will find these results valuable as they look for ways to improve their financial status.

Moreover, central food production presents unique management opportunities and challenges. Therefore, two articles address central foodservice operations. My article shows perspectives of school foodservice directors on several aspects of central foodservice systems. Responses from these directors provide useful information for directors considering central kitchens in their district. Additionally, Lee, Shanklin, and Wie examined composting and recycling at a central kitchen and three satellite schools. Results indicate that composting and cardboard recycling results in significant cost savings.

Thanks to all of these individuals who have contributed to the *Journal* and to the profession. I encourage others to make submissions of research articles to the *Journal*. Few Practical Solutions articles have been submitted, but I know that there are lots of great examples of research in practice! These are articles that "describe a problem or challenge faced by a school foodservice operation" and discuss solutions to the problem that led to operational effectiveness and efficiency. If you have a good example, please take the time to write it up and share it with your colleagues. Meanwhile, I hope that you will enjoy reading this issue.

Jeannie Sneed, PhD, RD, SFNS

*Editor*
School Meals: Benefits and Challenges


Phyllis Griffith, RD, SFNS; Barry Sackin, SFNS; and Diane Bierbauer, RD, SFNS

The federal government has provided support for school meals for more than 50 years. Starting with the enactment of the National School Lunch Act in 1946 and then expanded by the Child Nutrition Act of 1966, school meals have been an important part of both the nation’s commitment to nutrition and the safety net for America’s children.

In 1998, the U.S. Department of Agriculture (USDA) studied the nutritional contributions of school meals in the School Nutrition Dietary Assessment (SNDA) report. Based on the findings of the study, USDA issued revised menu-planning guidelines, and federal law required that school meals meet the current standards of the Dietary Guidelines for Americans. Since implementation of these legislative and regulatory changes of the past decade, meals have improved. Research and anecdotal evidence indicates that schools serve nutritious meals. Yet, there are challenges to school foodservice programs in meeting the nutrition mission. Financial pressures on schools and school nutrition programs have pushed them into offering less-nutritious foods. Furthermore, in an area of study called “meal time management,” the factors that can have a positive or negative impact on the effectiveness of the cafeteria include time to eat, the sequencing of playtime and mealtime, and the lunchroom ambiance.

Perhaps the greatest challenge to a successful nutrition program at school comes from outside the cafeteria. The ready availability of food items sold by groups other than the school food authority (SFA) undermines a healthy nutrition message. Also, a popular culture that emphasizes larger portions, fastfood-and-snack diets, and sedentary lifestyles makes it difficult to teach healthier behaviors. Schools should adopt policies that make schools models of healthy living.

The purpose of this paper is to discuss school meals and their nutrient contributions to children. Information about internal competition, meal time management, and external competition will be presented to show how these factors impact school meals.

Since its inception in 1946, the National School Lunch Program (NSLP) has provided nutritious meals to America’s children, and the history of the program is well known. Responding to the high incidence of inductees who exhibited signs of under-nutrition and malnutrition during pre-enlistment physicals for World War II, Congress passed the National School Lunch Act “as a matter of national security” (Richard B. Russell National School Lunch Act, 1998).

Then, in 1966, Congress expanded the mission of the federal school meals program by adding the School Breakfast Program. School breakfast, the Summer Food Service Program, and the three-tier (free, reduced-price, and full-pay) system for students represented a federal commitment to using schools as a means for providing nutrition to America’s children at risk of nutritional inadequacy. The school meals program became a significant part of the nation’s safety net. School meals have become a primary resource for alleviating hunger in America’s children. Furthermore, the program can ensure that all children have the opportunity to consume sufficient energy and nutrients to succeed in school.

School Meals and Nutrient Contribution. In 1992, USDA undertook a study to determine how school meals contribute to the diets of school children. The School Nutrition Dietary Assessment Study (SNDA), published in 1993, detailed 24-hour food intake recalls for 3,500 students. The results of SNDA became the basis for the first significant proposals for change in the way menu-planning for school meals is done. Consistent with previous studies, SNDA found that “the lunches of NSLP participants are richer in most vitamins and minerals than are those of non-participants, but they also are higher in food energy, fat, saturated fat, cholesterol, and sodium” (Devaney, Gordon, & Burghardt, 1993). Devaney et al. also reported, “With the
exception of vitamin C, participants consume higher levels of all vitamins and minerals than do non-participants." Not only do school meals offer higher levels of nutrients, but participants consume higher levels, as well.

In a 1996 General Accounting Office (GAO) report to U.S. Representative William Goodling, chair of the House Committee on Education and the Workforce, some of the findings from the SNDA study were summarized, including GAO's own research on plate waste. In its report, GAO looked at the SNDA study as it related to plate waste. In one conclusion, the report states that NLSP participants are more than twice as likely as non-participants to consume milk and milk products at lunch, which largely explains their higher intakes of calcium and vitamin A. Also, program participants consume more meat, poultry, fish, and meat mixtures than do non-participants. Program participants' greater consumption of foods from these two food groups contributes to the higher percentage of calories derived from fat and saturated fat. Moreover, participants are almost twice as likely as non-participants to eat vegetables, and are one-and-a-half times as likely to eat fruits and drink fruit juice than non-participants. Non-participants are about three times as likely as NLSP participants to eat sugar, sweets, sweetened beverages, crackers, and salty snack items (Waste From School Lunches, 1996).

The findings of the SNDA study regarding fat and saturated fat were used as the basis for promulgating new regulations for school meal menu-planning. It should be pointed out that the SNDA study was conducted in 1992 and published in 1993, two years before the Dietary Guidelines for Americans (DGAs) established targets for fat and saturated fat in diets. Even then, "Forty-four percent of schools offer[ed] at least one option of a complete NLSP lunch, containing all five required foods, that provides an average over one week of no more than 30% of food energy from fat" (Devaney et al, 1993). Results of the SNDA-II study, released on January 10, 2001, showed an improvement in meals served. While 71% of all secondary schools offered lunches that meet the dietary guidelines for fat in SNDA, 91% did in SNDA-II. Results for elementary schools were even more impressive—from 34% to 82% of schools.

A portion of the revised regulations for menu-planning also required nutrient assessments as part of school foodservice program reviews. Although this information has not been captured at the national level, several states already have compiled the data. In conducting more than 300 nutrient assessments, Arizona has found that school district menus are averaging up to 31% calories from fat. In Maryland, the most recent data from 22 of the 24 districts in the state, indicate that elementary schools are planning lunch menus with an average of less than 31% calories from fat and 10.5% calories from saturated fat. Secondary schools are just slightly higher at 31.7% and 10.8%, respectively. In California, only 23% of the almost 1,100 school districts were meeting the Dietary Guidelines for fat and saturated fat in 1990, but more than 50% were meeting the Guidelines in 1998—with the others missing by a very small margin. These data are encouraging.

In addition, data from a 1998 Consumer Report study of more than 1,300 school meals found that during a five-day school week, meals averaged 32% calories from fat and 12% calories from saturated fat, both just slightly above the 30% and 10% guidelines, respectively. This study also found that the meals contained more than adequate amounts of protein and calcium. Energy provided by the meals was more than adequate for 5th- and 6th-graders (School Lunch Program, 1996). Furthermore, studies conducted on the School Breakfast Program (SBP) have found that breakfasts of participants in the SBP exceeded the goal of 25% of the RDA for energy, and contain significantly more calcium, phosphorus, magnesium, thiamin, and riboflavin than breakfasts of non-participants (Nutrition and Your Health: Dietary Guidelines for Americans, 1995).

Another factor that needs to be considered in evaluating school meals with regard to meeting dietary requirements is the language of the Guidelines. "To meet the Dietary Guidelines for Americans, choose a diet with most of the calories from grain products, vegetables, fruits, lowfat milk products, lean meats, fish, poultry, and dry beans. Choose fewer calories from fats and sweets" (Promoting Healthy Eating: An Investment in the Future, A Report to Congress, 1999). The Guidelines provide advice to Americans with an emphasis on choice. Moreover, the National School Lunch Act requires that school breakfasts and lunches are consistent with the goals of the most recent Dietary Guidelines for Americans..." (Richard B. Russell National School Lunch Act, 1998). It is apparent that children need to be educated on making healthy eating choices. When the GAO surveyed cafeteria managers about plate waste it found wasted food items ranged from cooked vegetables at 42%, raw vegetables at 30%, canned and fresh fruits at 22% and 21%, respectively, to milk at 11% (School Lunch Program, 1996). This sends a clear message that we need to do a better job at educating our children to make healthier choices.

Nutrition Education. In 2000, the federal government's investment in child nutrition programs was expected to exceed $9.5 billion. This provide[d] meals and supplements to almost 30 million children. Of this, a scant $10 million was appropriated to Team Nutrition, USDA's program to develop and disseminate nutrition education materials to the classroom. In addition, the Nutrition Education and Training (NET) program has not been funded for the past two years. In previous years, NET has provided states with funds for state and local agency programs, providing nutrition education to schools and school foodservice programs. NET is authorized to receive 50 cents per enrolled child each year, or approximately $27 million.

In 1998, the last year these figures were recorded, the federal government spent less than 18 cents per enrolled child on nutrition education. By comparison, the Food Stamp program spent $2.11 per recipient, while the Women, Infants, and Children (WIC) program spent $24.34 for nutrition education and $16.94 for WIC breastfeeding education and promotion. That same year, the Food Distribution Program on Indian Reservations spent $1.60 per person. (Promoting Healthy Eating, 1999). If our children are to truly benefit from the significant investment in school meals and learn to make healthy choices for a lifetime, we must do a better job of providing them with appropriate nutrition education.

Financial Pressure. A factor in the ability of school meals to deliver better nutrition to children is the pressure to expand food offerings in competition with the school lunch meal to meet the financial expectations of the school district. In its guide to developing effective school health policies, Fit, Healthy and Ready to Learn: A School Health Policy Guide, the National...
Association of State Boards of Education (NASBE) states, “School foodservice is an essential aspect of the educational mission of schools. Yet, four-fifths of middle and high school foodservice coordinators have reported that their foodservice programs were expected to break even financially, not including salaries. Furthermore, more than one-fourth said that their programs were expected to earn money beyond the costs of the program” (Bogden, 2000).

This financial pressure is just one reason why school foodservice programs compete with such establishments as fast-food operations—and one reason why students expect the choice of similar items in the school cafeteria. In recent months, some concern has been expressed about those schools that give soda away free with a school meal. The American School Food Service Association (ASFLA) does not condone this practice. It does, however, understand it. While there does not appear to be a large number of schools that follow this practice, several do report that the decision was made by school administrators and not by school nutrition professionals. The reason is that the soda may cause more students to stay on campus during the meal period, which improves school safety.

**Meal Time Management.** School cafeterias offer meals that provide more nutrients than other options available to children, and evidence from the SNDA study indicates that participants in the school lunch program consume more nutrients than non-participants do. However, too many children are not fully realizing the benefits of school meals because of limitations imposed by the lunchroom environment. Three factors, which are external to the control of the foodservice program, seem to impact meal time management: time to eat, the sequencing of playtime and mealtime, and the lunchroom ambiance.

In *Fit, Healthy and Ready to Learn*, developed in coordination with the Centers for Disease Control and Prevention (CDC), two of these concerns are addressed as a proposed school policy: “Eating as a Positive Experience. Students and staff shall have adequate space to eat meals in pleasant surroundings and shall have adequate time to eat, relax, and socialize...” (Bogden, 2000). The question of scheduling time to eat is difficult to quantify and apply objectively to all situations. In *Keys to Excellence, Standards of Practice for Nutrition Integrity* (1995), ASFSA recommends that students have no less than 10 minutes to eat breakfast and 20 minutes to eat lunch after receiving their meal. This recommendation has been adopted in the NASBE policy proposals. However, there are reports of high schools with student populations of 2,000 or more that schedule a single 30-minute lunch period. Schools using block scheduling may not include a lunch period at all. Schools may elect to offer optional additional class time that a student may choose rather than a meal period. And virtually all high schools schedule a broad variety of alternative activities, including club meetings and rallies, concurrent with the meal period, giving students poor alternatives to either eat or participate.

There are a number of factors affecting the issue of “pleasant surroundings.” Is the physical environment of the lunchroom clean, attractive, well lit, and clean smelling? Then, beyond this is the emotional/psychological environment. School cafeteria managers talk about lunchroom monitors whose treatment of students is not conducive to a healthy eating experience. Rigid rules, absolute quiet, not allowing children to leave the table until all children have finished, yelling at children who don’t conform to the standards, and having contests rewarding children for finishing quickly have all been reported. None of these practices creates “pleasant surroundings.”

Still another element—reported anecdotally—is that many schools combine recreation, recess, or free time with the lunch period, and while some schools allow students to go to the play yard before scheduled lunch periods, other schools insist that the students eat first. The anecdotal evidence shows that when children play before lunch, plate waste decreases and nutrient intake improves.

In the QAO survey, cafeteria managers were asked which factors contributed to plate waste. “Seventy-eight percent of the cafeteria managers cited a non-food reason—student’s attention on recess, free time, or socializing—when asked why students at their school did not eat all of their school lunch” (School Lunch Program, 1996). To clarify the issue, the FY 2001 Agriculture Appropriations bill includes report language directing USDA to undertake a plate waste study to generate reliable data on the impact of offer vs. serve, number and duration of meal times, and the eat first/play first questions. If data support what school foodservice professionals believe to be true, the report will provide a basis for developing policy on what ASFSA is calling, “meal time management.”

**Internal Competition.** Perhaps the greatest challenge to schools’ ability to raise the standard of children’s diets, at least at school, comes from outside of the cafeteria. Schools, even at the elementary level, are being pressured to expand the sale of a variety of products to students to raise funds for programs and services that used to be funded by education money. And, according to the Washington Post, “The majority of principals, just like many of their students’ parents, dread spending time every year raising money for their schools...but feel they have no other way to pay for needed school equipment and field trips. The National Association of Elementary School Principals conducted a survey of nearly 700 administrators, which showed that 76% have seen an increased need for such fundraisers in the last 10 years...” (The Washington Post, 2000). And in middle and high schools, the problem is even worse. NASBE recommends that “education decisionmakers should not let financial pressures blind them to the larger purpose of foodservice programs, which is to promote academic achievement and good health” (Bogden, 2000).

For a number of reasons, food sales are the most popular fundraising effort. They’re easy, and kids spend a lot of money on food. There also is an enormous amount of money invested in advertising the food that schools sell, which indirectly facilitates the sales on behalf of the schools. Therefore, the profits on most school food sales are very significant and the schools have difficulty turning away from the money. The question of food sales that compete with the foodservice program in America’s schools has many dimensions. In a *School Board News* article, Gary Ruskin, director of Commercial Alert in Washington, D.C., decried the commercialization of schools, but says, “Yet, guess who’s marketing those junk foods? The public schools. Channel One promotes a parade of junk food and fastfood to impressionable children. Coke and Pepsi, which have a major presence in many schools, are laden with sugar, excess calories, caffeine, and other additives...” (Ruskin, 2000).

The issue of commercialization is a ma-
Current Issues

JOR CHALLENGE TO NUTRITIOUS SCHOOL MEALS
Programs. Exclusive pouring rights contracts, where one of the major soft drink
bottlers seeks to be the only brand available on school campuses in exchange for huge
signing bonuses and profits are becoming more common. This past year, the Associated
Student Body of Lakewood High School, Long Beach, Calif., passed a resolution
that read, in part, "Whereas fundraising activities provide for the general welfare,
moral and educational experiences beyond those provided by the district and... Whereas
authorization has been given by the LBUSD Board of Education to allow the
Associated Student Body to sell food and beverages on campus... Whereas contracts
for the sale of carbonated beverages is promoted by the state legislature to be non-
exclusive under Education Code... We hereby authorize the Activities Specialist, Joel War,
to act in our behalf to negotiate and enter into beverage contracts through June 30,
2005, which strive to meet these ideals" (Resolution by the Lakewood High School
Associated Student Body, 2000).

In an interview on National Public Radio in Spring 2000, the principal of Blair High
School in Bethesda, Md., would not answer a question regarding how much revenue his
exclusive soda contract generates each year, but implied that it was a six figure
amount. And when asked about the impact on children’s health, the principal acknowl-
edged the problem, but could not dismiss the revenue.

A brief review of the history of federal
legislation and regulation on competitive
food sales is important. The Child Nutrition
Act of 1966 included a section that gave the
secretary of Agriculture the authority to
promulgate regulations necessary to carry
out the mission of the government for child
nutrition programs. In 1970, recognizing
that the increasing consumption of “junk
food” was impeding the effectiveness of
school meal programs, the Act was amended
to include “regulations relating to the ser-
vice of food in participating schools and ser-
vice institutions in competition with pro-
grams authorized under this Act and the
National School Lunch Act” (Child Nutri-
tion Act of 1966). As a result of this amend-
ment, many schools lost revenues on which
they had come to depend. So, in 1972, Con-
gress responded to pressure from the school
community, student organizations, and
companies selling to schools by again
amending the Child Nutrition Act of 1966 to
add “[s]uch regulations shall not prohibit
the sale of competitive foods in foodservice
facilities or areas during the time of service
of food under this Act or National School
Lunch Act if the proceeds from the sales of
such foods will inure to the benefit of the
schools or organizations approved by the
schools” (Child Nutrition Act of 1966). Con-
gress also responded to concerns about the
quality of children’s diets, and expanded the
statute in 1977, giving the secretary of
Agriculture authority to regulate which food
items would be allowed as competitive
foods. USDA responded with a rule that es-
lished a definition for “nutritious foods”
and, conversely, “non-nutritious foods.”

In 1980, the National Soft Drink Associa-
tion sued USDA, claiming that the Depart-
ment had exceeded its statutory authority.
On appeal, the soft drink industry won
based on what has become known as the
“time and place” rule, which means that
USDA has authority only during the service
period in which school meals are being sold and
served. The appellate decision agreed
with the concerns that prompted the regu-
lations in the first place, but based its rul-
ing strictly on the statutory question. A final
regulation implemented in 1985, subse-
quent to the court decision, followed the di-
rction required by the court and addressed
food sales only at the time and place of
school meal service. However, the regula-
tion specifies the authority of state and lo-
cal agencies to establish more restrictive
rules. As a result, there is a patchwork of
policies throughout the nation. Further-
more, even where there are stronger poli-
cies, implementation and oversight remain
a significant problem.

The federal commitment to child nutri-
tion programs is currently $9.5 billion dol-
ars. Approximately half of this is a direct
appropriation from the federal revenues
and half from transfer of funds from import
duties allocated to the USDA (H.R. 4451,
106th Congress, 2000). This is a significant
investment in children’s nutritional health.
The availability and the promotion of com-
petitive sales on school campuses diminish
the potential for school meals to deliver on
the nation’s commitment to providing
nutritious meals to children. It is incum-
bent on Congress to protect its investment
by establishing policy that will maximize
participation in the school meal programs.

Several states have promulgated rules
on food sales on campuses that are more
restrictive than the current federal regula-
tions. For example, West Virginia has estab-
lished nutrition standards for foods sold on
campus, including a prohibition on sales of
carbonated beverages in elementary and
middle schools. California law requires that
half of all foods sold on campus, excluding
school meals, comes from a list of items
identified as nutritious and the other half
may come from foods that comply with cur-
rent federal guidelines. Furthermore, Cali-
ifornia limits the number of times student
groups may hold food sales each year.

In fact, Fit, Healthy and Ready to Learn
states that “the sale of all foods on school
grounds shall be under the management of
the school foodservice program, except
foods sold as part of a fundraising activity.
In middle and high schools, food and bever-
ages shall not be sold from vending ma-
machines or school stores during school
hours—until 30 minutes after the end of
the last lunch period unless they are part of
the school foodservice program” (Bogden,
2000). A policy similar to this or other ele-
ments included in the NASBE policy rec-
ommendations would make significant
progress toward ensuring nutrition integrity
on school campuses.

CONCLUSIONS AND
APPLICATION
School meal programs have proven effec-
tive in delivering nutritious meals to Amer-
ica’s children. Children participating in
the school meal programs have been found to
have higher intakes of most vitamins and
minerals than non-participants. These pro-
grams are particularly critical in serving
children at risk of food and nutrition inade-
quacy. However, the pressures placed on
school foodservice programs to meet profit
goals established by their districts, and the
availability of other foods sold on campuses
outside of the school foodservice program
in order to raise funds for school and stu-
dent activities, detract from student partici-
pation in the programs. Federal policy
should promote maximum participation in
the federal nutrition programs. To this end,
we recommend the following policy initia-
tives:

- The secretary of Agriculture should
  have the statutory authority to regulate
  all food sales on campus, at least until
  after the last lunch period.
- Schools should be required to provide

The Journal of Child Nutrition & Management, 25(1) 2001
Current Issues

a sufficient number of lunch periods of sufficient duration to ensure that all children have a minimum of 10 minutes for breakfast and 20 minutes for lunch after they receive their meal.

- Federal policy should recommend that students play first and return to the classroom after lunch.
- Federal, state, and local governments should allocate sufficient funds to schools to reduce or eliminate the need to supplement appropriations with on-campus fundraising.
- Congress should fund nutrition education to the full extent authorized.

REFERENCES


Developing a Cycle Menu Based on Children’s Preferences to Meet the Menu-Planning Option of Assisted NuMenus

Ellen L. Shanley, MBA, RD, CD-N; Colleen A. Thompson, MS, RD; and Susan S. Fiore, MS, RD

In response to the U.S. Department of Agriculture’s (USDA) Healthy School Meals Initiative, the state of Connecticut developed a cycle menu that meets the Assisted NuMenus option and reflects the state’s school children’s preferences and the new federal regulations. In order to accomplish this, a six-page survey was developed to determine food preferences as perceived by school foodservice directors. A total of 144 surveys were mailed to public school foodservice directors, with a final return rate of 70%.

To accurately reflect consumption as indicated in the new USDA regulations for NuMenus, there was a need to develop a state “recipe” for milk and other food items consumed on a daily basis. This was accomplished by computing consumption of these items for all of the districts. A recipe was then created using actual consumption figures and weighted proportionately. Recipe sources were identified for entree items so that appropriate food specifications could be identified when the cycle menu was written.

Based on the original survey, a second survey was developed, which was distributed to 4th- and 7th-grade children to assess their reactions to the most popular entrees identified by the foodservice directors. Those entrees with a rating of 2.5 or greater (using a scale of one to four) on the director/manager survey were included on the student preference survey. Surveys were mailed to 150 public and private school systems in the state. Seventy-seven school systems responded, reflecting a 51% return rate. Fifty-six percent of the respondents were from small districts (1 to 4 schools), 44% from medium districts (5 to 19 schools), and there was no return from large districts (over 20 schools). A total of 5,024 surveys were returned with 63% from 4th-grade students and 37% from 7th-grade students. A four-week cycle menu has been developed and reflects input from both directors and students. A focus group met to discuss the feasibility of the menu. The menu will be pilot-tested to refine it as needed, identify problems, and address cost.

The USDA regulation on Healthy Meals for Americans by the U.S. Congress was established in 1994. By the 1996-97 school year, all schools participating in federally funded school breakfast and lunch programs in the United States were mandated to meet the Dietary Guidelines for Americans (DGAs) (Healthy Meals for Americans Act, 1994). This regulation, referred to as the School Meals Initiative for Healthy Children (SMI), was justified in part by a 1993 report that indicated a positive correlation between nutrition and the cognitive development of children (Burghardt, Gordon, Chapman, & Fraker, 1993). In addition, the general public, who was informed about the scientific data that relates health status to dietary habits, was interested in improving school meals to impact the current and future health status of children. The school foodservice profession is in a unique position to affect not only a child’s present food intake by the offering of meals that adhere to the DGAs, but also choices made by children through nutrition education (Collins Pateman et al., 1995; Rasicot, 1997; A summary of the Centers for Disease Control guidelines, 1997).

The goal of the original regulation was for school foodservice operators to plan their menus using a computerized nutrient analysis based on weekly averages. The caloric content of the meal must meet at least 30% of the Recommended Dietary Allowances (RDAs) for the age group for lunch and 25% of the RDA for breakfast. In addition, 30% or less of the calories were to come from fat, 10% or less from saturated fat, and the menu must meet the RDAs for iron, calcium, and vitamins A and C. Recommendations are made to increase fiber and decrease sodium and cholesterol.

The computerized nutrient analysis is termed NuMenus if done by the school itself, and termed Assisted NuMenus.

Ellen L. Shanley and Colleen A. Thompson are extension instructors in residence, Department of Nutritional Sciences, University of Connecticut, Storrs, Conn. Susan S. Fiore is nutrition education and training program director, Child Nutrition Programs, Connecticut State Department of Education, Middletown, Conn.
Research in Action

Figure 1. Example of method used to assess milk consumption in Connecticut schools

Please fill in the percent of students purchasing the following varieties of milk. When filling in the percentages for each category, please have numbers total 100%. Remember, you are estimating what you use!

<table>
<thead>
<tr>
<th>Variety</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Milk</td>
<td>%</td>
</tr>
<tr>
<td>2% Milk</td>
<td>%</td>
</tr>
<tr>
<td>1% Milk</td>
<td>%</td>
</tr>
<tr>
<td>Skim Milk</td>
<td>%</td>
</tr>
<tr>
<td>2% Chocolate</td>
<td>%</td>
</tr>
<tr>
<td>1% Chocolate</td>
<td>%</td>
</tr>
<tr>
<td>Other</td>
<td>%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
</tr>
</tbody>
</table>

do to distribute to 4th- and 7th-grade teachers, who subsequently gave the survey to the children.

Permissions. A letter explaining the focus and intent of the questionnaire was given to the parent of the child prior to the distribution of the survey. The letter indicated that a child could freely choose to participate without pressure or discrimination.

Data Instrument and Procedure Development. The questionnaires were developed specifically for this study. A group of four professionals—two from the Connecticut Department of Education’s Child Nutrition Programs and two from the University of Connecticut’s Department of Nutritional Sciences faculty—developed the six-page food preference questionnaire for school foodservice directors/managers. This questionnaire included many detailed questions concerning selection of food items by children. Figure 1 is an example of a question on the survey regarding milk consumption. This method of data collection was selected so that a state recipe could be determined for certain food items.

A rating scale of 1 to 4 was used to determine preferences for entrees, vegetables, and such miscellaneous items as rolls, bread, rice, macaroni salad, etc. This four-point scale was selected to force directors/managers to make a definitive choice, thereby eliminating the middle or average choice. The scale identified four as “very popular” and one as “not offered.” In addition, it was determined that not only was the entree selection itself important, but the recipe served also was highly regarded (i.e., the school’s own recipe, an USDA recipe, or a purchased brand name product).

The food preference survey for children was a direct result of the entree ratings by the foodservice directors/managers. It was developed after the data from the director/manager survey had been analyzed. Only the entrees that received a rating of 2.5 or higher on the director/manager survey were featured on the student survey in alphabetical order. The children were asked to rate each of the items on a rating scale using the words awful, dislike, like, awesome, and never tried. The children’s survey was pilot-tested in one elementary and one secondary classroom to determine if any changes in instructions or format were necessary. No changes were made after the pilot test.

Data Collection. Data for the director/manager food preference survey were collected in April through June 1996. Questionnaires were mailed to each foodservice director/manager in April, and a follow-up questionnaire was mailed approximately one month later. The food preference survey for children was mailed and data was collected in Spring 1997. The four-week cycle menu was developed using data from both the director/manager survey and the student preference survey. The director/manager survey had a section in which the respondent indicated if he/she was interested in participating in a focus group to re-

METHODOLOGY

Sample. All 148 public SFAs, 39 private schools, and 41 residential child care institutions were sent a six-page food preference survey for the foodservice director/manager to complete. A second one-page survey was mailed to the foodservice directors/managers at 150 public and private schools if a consultant or outside authority completes the nutrient analysis. The regulation was modified from the original, following an outcry from the American School Food Service Association (ASFS) and schools, and currently permits schools to continue to use food-based menu plans or any “reasonable” approach. Schools that choose these approaches still must meet the DGAs when the state department of education reviews their menus (Healthy Meals for Americans Act, 1994).

In order for schools to meet this regulation, USDA allowed state education agencies to grant waivers for up to two years. The Connecticut Department of Education gave a waiver for two years to allow schools additional time to comply with this federal regulation. In size, 97% of Connecticut’s school districts are small (1 to 4 schools) and medium (5 to 19 schools) systems, and they often do not have the educational and financial resources available to them, unlike many larger districts. Many school foodservice employees were overwhelmed with the task of having their menus meet the DGAs. USDA provided all states with a five-week cycle menu as an Assisted Nutrition menu planning option. The Connecticut Nutrition Education and Training Program (NET) reviewed the menu and determined that it would be beneficial for Connecticut to develop a cycle menu specific to the state.

Connecticut’s NET Program proposed that the menu should reflect the preferences of the population. To assess food preferences, surveys for school foodservice directors and children needed to be developed and data needed to be collected. It was concluded that the cycle menu should reflect the consumption of certain key menu items and a “recipe” for these items should be developed from the data received. The menu will be pilot-tested for acceptance and cost in five school districts. The cycle menu developed is an option available to school food authorities (SFAs) as a way to comply with the federal regulations.

The Journal of CHILD NUTRITION & MANAGEMENT, 25(1) 2001
Table 1. School district size and responses by foodservice directors and children

<table>
<thead>
<tr>
<th>District Size</th>
<th># of Schools</th>
<th>Connecticut School Districts by Size</th>
<th>% Response by Foodservice Director</th>
<th>% Response by Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>1-4 Schools</td>
<td>48%</td>
<td>43%</td>
<td>56%</td>
</tr>
<tr>
<td>Medium</td>
<td>5-19 Schools</td>
<td>49%</td>
<td>54%</td>
<td>44%</td>
</tr>
<tr>
<td>Large</td>
<td>&gt;19 Schools</td>
<td>3%</td>
<td>3%</td>
<td>0%</td>
</tr>
</tbody>
</table>

view the completed menu. Those who expressed interest were contacted and a focus group of 10 foodservice directors met in Winter 1998. The purpose of the focus group was to provide feedback on the completed menu. The focus group evaluated the cycle menu for perceived student acceptance, production feasibility, and cost-effectiveness.

Data Analysis. Data from each individual school foodservice director/manager and from the children’s food preference survey were entered and analyzed using SPSS. Frequencies and means were determined for each item. NutriKids, a USDA-approved nutrient analysis software, was used for all analyses of the cycle menu.

RESULTS AND DISCUSSION

Foodservice Director/Manager Questionnaire. A total of 148 surveys were sent, with a 70% return rate (n=103). As indicated in Table 1, the response from food directors/managers correlates closely with school district size. After summarizing the data, state recipes were developed for specific menu items, including milk, fruit, and fruit juice. The data indicated that Connecticut’s milk consumption/recipe varied from USDA’s, and that Connecticut’s milk was only six calories higher, but that calories from fat and saturated fat are considerably higher (Figure 2). Connecticut’s recipe for milk was computed from milk consumption data and indicates that more whole milk and 2% milk are being used in the schools. To accurately plan a menu for the state, it is necessary to determine what is actually being consumed, so consumption figures also were determined for fruit. A recipe was developed reflecting canned fruit consumption at 47% and fresh fruit consumption at 33%, resulting in 86 calories for a serving of fruit. Data indicated that fresh fruit was served seasonally.

Originally, a rating scale was used to assess preference for uncooked vegetables. After reviewing the data, a recipe for uncooked vegetables was created, thereby allowing a foodservice director the option of choosing a vegetable instead of featuring a specific vegetable on the menu. This affords the foodservice director more flexibility when preparing the menu (i.e., putting “raw vegetables” on the menu instead of “raw carrots” gives the director a choice of raw vegetables they can serve that day). School foodservice directors/managers also identified whether the entree was prepared with a school recipe or a USDA recipe, or if a purchased branded product was used. Many schools used brand-name products and heat-and-serve items using minimal preparation.

Student Food Preference Questionnaire. Fifty-one percent of the 150 survey packets sent were completed, with a total response of 5,024. Table 1 indicates the percentage of surveys returned by small and medium-sized districts and the response breakdown of 4th and 7th graders. Many of the schools in Connecticut have middle schools, where survey distribution is more cumbersome. This may, in part, explain a lower response. Table 2 is a combination of means for 4th and 7th graders. Data for student preferences were summarized and distributed to each school system that participated in this survey.

Menu Development. Based on the data, a four-week selective cycle menu was developed for elementary children, and the menu was analyzed using the NutriKids software. Although the menu meets USDA requirements for grades K to 6, it could easily be adjusted to meet the kindergarten through 8th grade requirements by only slightly increasing the weekly calories. In addition to meeting the DGAs, a goal was to have a “kid-friendly” menu, which may be defined as the foods that kids really like and are included as frequently as possible. The primary menu format is two entree selections, a vegetable and/or starch, dessert, and milk.

To meet USDA regulations for Assisted NuMenus, each menu item had to be weighted to accurately determine nutrient analysis. Each of the items on the cycle menu was weighted to reflect the student preference as derived from both the foodservice/manager and the student questionnaires. For example, if pizza and fish sticks are offered as entrees at a meal, the foodservice director had to plan for the percentage of students who will choose each entree. The nutrient analysis reflects those percentages.
Table 2. Student preferences of entrees

<table>
<thead>
<tr>
<th>Food</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken Nuggets</td>
<td>3.4</td>
<td>0.85</td>
</tr>
<tr>
<td>Cheese Pizza</td>
<td>3.3</td>
<td>0.94</td>
</tr>
<tr>
<td>Pepperoni Pizza</td>
<td>3.2</td>
<td>1.06</td>
</tr>
<tr>
<td>Pancakes</td>
<td>3.1</td>
<td>0.97</td>
</tr>
<tr>
<td>French Bread Pizza</td>
<td>3.1</td>
<td>1.01</td>
</tr>
<tr>
<td>Tacos</td>
<td>3.1</td>
<td>1.10</td>
</tr>
<tr>
<td>French Toast Sticks</td>
<td>3.0</td>
<td>1.05</td>
</tr>
<tr>
<td>Chicken Patty on a Bun</td>
<td>2.9</td>
<td>1.05</td>
</tr>
<tr>
<td>Pasta With Meat Sauce</td>
<td>2.9</td>
<td>1.06</td>
</tr>
<tr>
<td>Calzone</td>
<td>2.9</td>
<td>1.12</td>
</tr>
<tr>
<td>Macaroni &amp; Cheese</td>
<td>2.9</td>
<td>1.11</td>
</tr>
<tr>
<td>Grilled Cheese Sandwich</td>
<td>2.9</td>
<td>1.03</td>
</tr>
<tr>
<td>Hot Dog on a Bun</td>
<td>2.9</td>
<td>1.06</td>
</tr>
<tr>
<td>Lasagna</td>
<td>2.9</td>
<td>1.05</td>
</tr>
<tr>
<td>Cheeseburger</td>
<td>2.8</td>
<td>1.01</td>
</tr>
<tr>
<td>Roast Turkey</td>
<td>2.8</td>
<td>1.08</td>
</tr>
<tr>
<td>Meatball Grinder</td>
<td>2.8</td>
<td>1.14</td>
</tr>
<tr>
<td>Deli Sandwich</td>
<td>2.8</td>
<td>1.03</td>
</tr>
<tr>
<td>Chef Salad</td>
<td>2.7</td>
<td>1.05</td>
</tr>
<tr>
<td>Baked Potato With Toppings</td>
<td>2.7</td>
<td>1.02</td>
</tr>
<tr>
<td>Peanut Butter &amp; Jelly Sandwich</td>
<td>2.3</td>
<td>1.07</td>
</tr>
<tr>
<td>Tuna Salad</td>
<td>2.1</td>
<td>1.14</td>
</tr>
<tr>
<td>Turkey Hot Dog on a Bun</td>
<td>1.9</td>
<td>1.13</td>
</tr>
</tbody>
</table>

Awesome=4, Like=3, Dislike=2, Awful=1, Never Tried=Not Included

The focus group reviewed the cycle menu and had difficulty with the rationale of nutrient-analyzed menus. Most of the group was somewhat resistant to the concept of changing to Assisted NuMenus from a traditional food-based meal pattern. As previously discussed, the menu is "kid friendly" and includes such items as light potato chips, tortilla chips, and baked desserts. Yet, the directors/managers expressed concern that there would be too much baking and too many selections, and due to concerns regarding insufficient cooking facilities at some schools, the participants suggested that the second entree choice be a cold sandwich. Also of concern was the use of available USDA commodity items, which would be used in the menu. Cost also was questionable, although the focus group was not sure that the menu would have a higher food cost than their present menus. Yet, another apprehension of the group was the lack of menu flexibility and with understanding the Assisted NuMenus concept.

CONCLUSIONS AND APPLICATION

Assisted NuMenus is one option for states, a region of a state, or a region of the country to develop and provide for SFAs to meet SMI regulations. It is important to ensure that food preference is considered when developing a cycle menu. It is interesting to see how the milk recipe by itself may impact the nutrient analysis of a menu. To develop a satisfactory menu, a grasp of both student and director/manager preferences is imperative.

Having thoroughly assessed food preferences as indicated by foodservice directors/managers and students, it was easy to defend menu selections when they were presented to the focus group. However, it was difficult to satisfactorily address all of the focus group's concerns. It was apparent that all members of the focus group would not be in complete agreement on any menu that would be developed. It was determined that one way to increase menu flex-

ibility would be to incorporate a list of substitutes for certain menu items. If some type of "exchange list" is provided, it would allow SFAs increased opportunities to individualize the menu to meet their needs. It would be essential to have a manual to accompany the menu, so that directors/managers would understand how to correctly use the "exchange list." [Note: Assisted NuMenus is clearly a viable alternative. A copy of the cycle menu may be requested from the authors.]

It is expected that a final menu will include some of the changes suggested by the focus group. With the current knowledge that Assisted NuMenus must consist of a five-week cycle menu, an additional week will be included. The five-week cycle menu will be pilot-tested by five school districts in Connecticut. The pilot tests will evaluate menu acceptance, cost and feasibility, and weighting of menu choices. Feedback received from foodservice directors/managers made it clear that the more weeks that are available for the cycle menu, the better the acceptance will be. This is due to the fact that a school district is then able to pick and choose a week as it desires, which offers more flexibility. There is interest by the Child Nutrition Programs agency in Connecticut to write another five-week cycle menu. By doing this, the flexibility of the menu will continue to be improved.

Another finding is that it would be beneficial to offer a cycle menu for breakfast to provide this option for schools. The Connecticut state agency would like to provide this option for the SFAs. Based on our review of menu analysis of breakfast programs in the state, it appears that many breakfast programs are not meeting the 25% calories as dictated by USDA.

In addition, training is an essential component of presenting the menu cycle to directors/managers. Therefore, training sessions will be planned to assist in menu implementation. A detailed manual will be provided for the kitchen staff, which will include a daily menu with serving sizes, quantities, and recipes. Also, training must take place at the work site to ensure that kitchen employees are aware of how production sheets must be completed. The goal of this project is to have a flexible and user-friendly cycle menu available for schools as an option to meet SMI regulations.
ACKNOWLEDGEMENTS
The authors wish to thank the Connecticut Department of Education’s Child Nutrition Programs, foodservice directors, teachers, and children who participated in the study. This research was supported in part by NET funding through the State of Connecticut, Department of Education, Child Nutrition Programs and represents scientific contribution, Storrs Agriculture Experiment Station, the University of Connecticut (Storrs, Conn.).

REFERENCES
Research in Action

Nutritional Quality of Reimbursable School Lunches Compared to Lunches Brought From Home in Elementary Schools in Two Southeastern Michigan Districts

Alice Jo Rainville, PhD, RD, CHE, SFNS

The purpose of this study was to investigate the nutritional quality and food items in reimbursable school lunches (RSL) compared to lunches brought from home (LBH) in elementary schools in two school districts in Southeastern Michigan. Trained observers recorded contents and amounts eaten for 570 lunches served to 2nd, 3rd, and 4th-grade boys and girls who were either African American or Caucasian. Although there was no significant difference in mean kilocalories between RSL (n=281) and LBH (n=289), RSL provided significantly fewer calories from fat (29%) than LBH (33%). And although there was no significant difference in saturated fat content of RSL vs. LBH, it was determined that RSL provided significantly more (p<0.001) protein, fiber, vitamins A, D, B6, B12, thiamin, riboflavin, niacin, folate, calcium, iron, and zinc than LBH, which was significantly higher (p<0.001) in carbohydrates, fat, sugar, and vitamin C.

Although the study showed that children who consumed RSL were more likely to meet dietary recommendations for percent kilocalories from fat, protein, calcium, vitamin A, and iron than children who consumed LBH, there were no differences in the nutrient content of lunches chosen or consumed when race or gender were analyzed.

Still, the total number of food items in RSL (3.7±1.1) was significantly higher than in LBH (3.4±1.0). Multivariate analysis of variance revealed statistically significant (p<0.0001) differences between the food items as a function of lunch type. Specifically, RSL had more total food items and more fruits, vegetables, and dairy products than LBH, whereas LBH had more snack items, bread/cereal items, and meat/meat alternates. RSL provided three times as many dairy products, twice as much fruit, and seven times the vegetable amounts as LBH, which provided three times as many snack items.

It was concluded that RSL were lower in fat, provided more nutrients overall, and provided more food variety than LBH. Publicity and marketing efforts should emphasize the superior nutritional quality and convenience of RSL compared to LBH.

The National School Lunch Program (NSLP) is available to 92% of students who attend public and private schools in America, and an average of 56% of these students participate in the school lunch program (Burchardt, Gordon, Chapman, Gleason, & Fraker, 1993). In 1995, there were regulatory changes in the NSLP that required compliance with the Dietary Guidelines for Americans and established one-third of the Recommended Dietary Allowances (RDAs) for the NSLP (U.S. Department of Agriculture, 1995). There have been few reports of the nutritional value of school lunches since the 1995 regulations, thus making it important to investigate the current nutritional value of school lunches compared to other types of lunches that children consume. A review of literature revealed limited information regarding the nutritional value of reimbursable school lunches (RSL) in elementary schools compared to lunches brought from home (LBH). The few studies that have been published indicated that RSL, in elementary, junior high, and high schools were superior in nutritional value to LBH. Some studies also have shown differences in food consumption among children of different racial backgrounds (Lytle et al., 1996; Melnik, Rhoades, Wales, Cowell, & Wolfe, 1998).

Elementary school children (n=583) in New York City who ate school lunches had significantly (p<0.02) higher consumption of fruits and vegetables and lower consumption of fats, oils, and sweets than children (n=97) who did

Alice Jo Rainville is associate professor, Human Nutrition Program, Eastern Michigan University, Ypsilanti, Mich.
not eat a school lunch (Melnik et al., 1998). The researchers found that children who participated in school lunch programs had improved overall dietary intake compared to children who did not participate. Similarly, a 1993 study of elementary school children’s lunches in New York showed that children who ate school lunches had better diets with more food variety than those who brought lunch from home (Wolfe & Campbell, 1993). The study also showed that children who consumed school lunches ate more fruits and vegetables than did the children who consumed lunches brought from home.

A 1991 study of 254 junior high school children’s lunches in Salt Lake City, Utah, showed that a greater percentage of children who ate school lunches met the RDAs for energy, protein, vitamin A, and iron than those who brought their lunches from home (Ho et al., 1991). Also, vitamin C intake was higher for those who brought lunch from home. A recent study (Gjengdahl & Seaborn, 1999) of 100 high school students’ self-reported purchases of RSL (n=92) vs. a la carte (n=88) vs. combination of RSL/a la carte (n=42) was conducted in Minnesota. The authors reported that RSL were significantly lower in fat than a la carte and combination lunches and higher in protein, vitamin A, calcium, and iron than a la carte lunches.

The School Nutrition Dietary Assessment Study (SNDA) (Burghardt et al., 1993) found that children who consumed RSL had higher intakes of vitamin A, calcium, zinc, and lower intakes of vitamin C than children who did not eat RSL. Milk and dairy products found in RSL increased the calcium and vitamin A intakes. RSL were higher in percent calories from fat and saturated fat than LBH. Children who consumed LBH consumed only 31% of the RDA for energy and less than one-third of the RDA for calcium, zinc, and vitamins A and B12.

Since most of these investigations were completed before the 1995 regulations were finalized, it is important to find out if RSL provide more nutritional value than LBH. The objectives of this study were to determine: 1) if there were differences in the nutritional quality of selected and consumed RSL compared to LBH in elementary schools in Southeastern Michigan; 2) which food choices accounted for differences in the nutritional quality; and 3) if there were differences in nutrient quality of lunches selected or consumed by boys compared to girls and African Americans compared to Caucasians.

**METHODOLOGY**

**Study Design.** The dimensions of type of lunch, school district, gender, and race were combined using a 2x2x2 factorial design. This permitted main effect comparisons between levels of each dimension (e.g. RSL compared to LBH), including such interactions between dimensions as whether RSL vs. LBH differences varied as a function of school district, gender, or race.

**Description of Sample.** A stratified random sample (n=570) of 2nd-, 3rd-, and 4th-grade students that included African American and Caucasian boys and girls in two Southeastern Michigan school districts were observed during lunch. These two districts were chosen based on their willingness to participate in the study. District 1 was managed by a foodservice management company; had 18% of children eligible for free and reduced lunches, and used nutrient-based menu-planning with a central kitchen that served 20 elementary schools, from which data were collected at four schools. Additionally, District 1 used a traditional cafeteria service.

On the other hand, District 2 was self-operated, had 25% of children eligible for free and reduced lunches, and used enhanced food-based menu-planning with a kitchen in each of the six elementary schools. Data were collected at all six schools. District 2 used a modified family-style service.

**Data Collection.** This study protocol was approved by the school districts and the university review committee. Parents of 2nd-, 3rd-, and 4th-grade children in the selected schools in the two districts were notified of the study via flyers sent home with children.

A pilot study was conducted in District 1 before data collection began, and the pilot study data were used to verify data collection techniques. The specific observation days in March through May 1998 were announced to avoid bias. Children were observed during lunch by trained observers who weighed and recorded portion sizes and offerings of reimbursable school lunches before the lunch period. This information was then used for data entry in nutrient analysis. Portion sizes of foods brought from home were determined by visual estimation. Food waste from all lunches

---

Figure 1: Percentage of children who met nutrient recommendations* by type of lunch in Southeastern Michigan elementary schools

---

*See Table 1 for nutrient recommendations for children ages 7-10. The percent kilocalories from fat recommendation is < 30% and saturated fat is < 10%.
was visually estimated and recorded. The visual estimation method was chosen because Comstock, St. Pierre, and Mackier-
nan (1981) found that visual estimation of plate waste by trained data collectors was highly correlated with actual percent waste in school lunches.

Data Analysis. Food Processor for Windows (7.11) (ESHA Research, Salem, Ore.) was used to analyze the nutrients in lunches. School districts provided labels and nutrition information for the foods served. Nutrition information for foods brought from home was obtained in two ways: visiting grocery stores and requesting information from food manufacturers. Multivariate analyses and descriptive statistics were computed using SPSS for Windows (8.0) (Chicago, Ill.), and Chi Square statistics were computed using Minitab for Windows (12.1) (State College, Pa.). Results were statistically significant if p<.05. There were four fixed factors in the 2 (type of lunch) x 2 (district) x 2 (gender) x 2 (race) multivariate analysis of variance followed by univariate tests. Due to the large sample size, the power to detect differences was high. Means for age-specific nutrients were compared to RDAs for children ages 7 to 10 (Food and Nutrition Board, 1989) and Nutrient Standards for School Lunch Programs for ages 7 to 10 (USDA, 1998). Eighteen data collection records were discarded due to incomplete data (n=10), ineligible children (n=7), and a child who became ill during lunch.

RESULTS AND DISCUSSION

Demographic Information. Of the 570 children who were observed, 281 consumed RSL and 289 consumed LBH. There were 300 boys, 279 girls, 258 African American children, and 312 Caucasian children who were observed. There were 280 children observed in District 1 and 290 children observed in District 2. No significant differences were found in the lunches eaten by boys and girls or by African Americans and Caucasians. Although this study did not include Hispanic children, the results of the study conducted by Melnick et al. (1998) did show significant differences in food consumption among African American, Hispanic, and Asian/Caucasian children.

Nutrient Content of Offered Lunches. Significant differences were found in the nutritional values of lunches served by the two districts. District 1 lunches provided significantly more sugar (p=0.01), fiber (p=0.001), vitamin A (p=0.001), vitamin B₆ (p=0.001), vitamin B₁₂ (p=0.002), vitamin C (p=0.001), vitamin D (p=0.013), folate (p=0.001), and zinc (p=0.001). District 2 lunches provided significantly more carbohydrate (p=0.039), riboflavin (p=0.001), iron (p=0.001), and sodium (p=0.015). These results were not surprising, since the enhanced food-based menus required more breads and grain foods. There were no significant differences in kilocalories, protein, fat, saturated fat, cholesterol, thiamin, niacin, and calcium between the two districts.

For both districts combined, there were significant differences in nutrients provided by RSL vs. LBH. As presented in Table 1, RSL provided significantly (p<0.007) more protein, fiber, cholesterol, vitamins A, B₆, B₁₂, thiamin, riboflavin, niacin, folate, calcium, iron, and zinc than LBH. The LBH were significantly (p<0.001) higher in carbohydrates, total fat, sugar, and vitamin C. However, no significant differences were found in kilocalories and saturated fat of RSL and LBH. The RSL provided 29% kcal from fat, 55% kcal from carbohydrates, and 16% kcal from protein; LBH provided 33% kcal from fat, 57% kcal from carbohydrates, and 10% kcal from protein. The percentages of nutrients found in RSL were within the Dietary Guidelines for Americans (DGAs) (USDA and USDHHS, 2000).

Nutrient Content of Consumed Lunches. An analysis of nutrient intake for children who consumed RSL compared to LBH revealed significant results for all nutrients except kilocalories, carbohydrates, fat, and saturated fat. Children who ate RSL consumed significantly (p<0.001) more protein, fiber, cholesterol, vitamins A, B₆, B₁₂, thiamin, riboflavin, niacin, folate, calcium, iron, sodium, and zinc. Children who ate LBH consumed significantly more sugar and vitamin C. The nutrient intake results were similar to those found for nutrients provided by the lunches offered, except

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>RSL</th>
<th>LBH</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (667 kcal)</td>
<td>584.6 ± 132.3</td>
<td>597.6 ± 212.1</td>
<td>0.105</td>
</tr>
<tr>
<td>Protein (9.3 g)</td>
<td>23.2 ± 5.9</td>
<td>15.6 ± 8.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>77.0 ± 22.5</td>
<td>85.4 ± 31.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Sugar (g)</td>
<td>29.6 ± 12.2</td>
<td>43.2 ± 25.7</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Fiber (g)</td>
<td>4.4 ± 2.0</td>
<td>3.8 ± 2.2</td>
<td>0.007</td>
</tr>
<tr>
<td>Total Fat (≤22 g)</td>
<td>18.4 ± 8.0</td>
<td>21.1 ± 10.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Saturated Fat (≤7g)</td>
<td>6.6 ± 2.4</td>
<td>6.5 ± 4.1</td>
<td>0.851</td>
</tr>
<tr>
<td>Cholesterol (mg)</td>
<td>46.5 ± 25.4</td>
<td>25.4 ± 36.3</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Vitamin A (233 RE)</td>
<td>402.4 ± 529.4</td>
<td>125.4 ± 342.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Thiamin (0.33 mg)</td>
<td>0.08 ± 0.25</td>
<td>0.35 ± 0.30</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Riboflavin (0.4 mg)</td>
<td>0.75 ± 0.28</td>
<td>0.29 ± 0.24</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Niacin (4.3 mg)</td>
<td>4.9 ± 2.6</td>
<td>4.2 ± 3.2</td>
<td>0.003</td>
</tr>
<tr>
<td>Vitamin B₆ (4.7mg)</td>
<td>0.33 ± 0.18</td>
<td>0.25 ± 0.24</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Vitamin B₁₂ (4.7µg)</td>
<td>1.11 ± 0.72</td>
<td>0.36 ± 0.62</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Calcium (267 mg)</td>
<td>160.0 ± 30.8</td>
<td>38.0 ± 43.7</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Iron (2.5 mg)</td>
<td>2.27 ± 0.91</td>
<td>1.44 ± 0.92</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Folate (33 µg)</td>
<td>525.0 ± 36.3</td>
<td>423.2 ± 35.8</td>
<td>0.002</td>
</tr>
<tr>
<td>Calcium (267 mg)</td>
<td>315.1 ± 130.0</td>
<td>160.9 ± 150.7</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Sodium</td>
<td>1026.7 ± 306.7</td>
<td>918.7 ± 600.3</td>
<td>0.003</td>
</tr>
<tr>
<td>Zinc (3.33 mg)</td>
<td>2.0 ± 1.4</td>
<td>1.4 ± 1.2</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

* Nutrient recommendations are from Nutrient Standards for School Lunch Programs for children ages 7-10, and 17. Recommended Dietary Allowances for children ages 7-10.
that carbohydrate and fat consumption differences were not statistically significant in this analysis.

Figure 1 shows the percentage of children who met one-third of the RDAs (Food and Nutrition Board, 1989) and/or nutrient standards for RSL for children ages 7 to 10 (USDA, 1998). The percentage of children who met the energy requirements for both types of lunches was about 8%. However, the children who consumed RSL were more likely to meet recommendations for ≤30% kcal from fat, protein, vitamin A, calcium, iron, and zinc, which were similar to those findings of Perry, Shannon, Stitt, and Bonner (1984) and Akin, Gullkey, Haines, and Popkin (1983). Children who consumed LBH were more likely to meet recommendations for vitamin C, a finding similar to that of Ho et al. (1991).

**Food Item Analysis of Lunches.** The total number of food items was significantly greater (p<0.005) for RSL (3.7±1.1) than for LBH (3.4±1.0). Multivariate analysis of variance revealed statistically significant (p<0.0001) differences between the food items as a function of lunch type. Specifically, RSL had more fruits, vegetables, and dairy products compared to LBH, which contained more bread/grain items and more meat/meat alternates due to sandwiches in LBH. However, RSL provided three times as many dairy products, two times as much fruit, and seven times as many vegetables as LBH, which provided three times as many snack items as RSL. Table 2 contains menus of typical RSL and LBH in this study.

Significant differences (p<0.0001) were found in the percentages of lunch types containing specific food items. Milk was included in 87% of RSL and only 7% of LBH, and 33% of LBH had vitamin C-fortified juice and drinks. Only 1% of RSL included vitamin C-fortified juice, and 9% of LBH included a purchased prepackaged lunch. Ten percent of LBH included fruit snacks, of which some were fortified with vitamin C.

Table 3 provides the cumulative counts of food items in lunches, compared by type. All of the categories were significant at p≤0.004 using Chi Square. These results showed that RSL were more likely to have more food variety, including more vegetables, fruits, and dairy products. LBH were more likely to have snack foods and more servings of breads and grains. These findings are similar to those reported by Wolfe and Campbell (1993).

The results of this food item analysis help to explain the differences found in nutrients provided by type of lunch. The variety of foods offered in RSL increased the nutrients available to children. RSL provided more thiamin, niacin, riboflavin, iron, and folate, although LBH had slightly more bread/grain foods. The calcium provided by RSL was much higher, which can be explained by the contribution of milk in RSL. The most popular milk selection in both school districts was 1% chocolate-flavored milk. The meat items offered in RSL contributed to the higher content of iron, zinc, cholesterol, and vitamin B₁₂. The fruits and vegetables in RSL accounted for the higher fiber, folate, and vitamins A and B₉ found in RSL. Snack foods probably accounted for the higher fat and sugar contents of LBH; 73% of LBH included snack foods and only 29% of RSL included snack foods. The higher vitamin C levels found in LBH are due to the inclusion of vitamin C-fortified drinks and fruit snacks.

**CONCLUSIONS AND APPLICATION**

This study confirmed the importance of reimbursable lunches to children's health from the standpoint of nutrients consumed. It can be concluded that RSL provided more variety and a better nutrient profile due to the guidelines and regulations of the NSLP that ensure nutritional quality. Food item analyses confirmed the results of the nutrient analyses. Seven to 10-year-old children who consumed RSL were more likely to meet dietary recommendations for protein, total fat, percent kilocalories from fat, vitamin A, calcium, zinc, and iron. Milk made an important difference in the protein, vitamin, and mineral intake of children who consumed RSL. Johnson, Panely, and Wang (1998) found that children ages 5 to 17 who consumed milk with lunch had higher intakes of vitamins A and E and calcium than children who consumed soft drinks, juice, and fruit drinks. Fortified juice and fruit snacks provided more of the vitamin C found in LBH. According to Stitt and Pilant (1997), milk consumption is declining and consumption of soft drinks and juice drinks is increasing. The fruits and vegetables included in RSL also provided more fiber and vitamins than LBH.

The strengths of this study included the study design that included boys and girls, African Americans and Caucasians, and two districts that used different menu-planning, production, and service systems. Limitations of this study were: only two districts in one state were used for data collection; the same child could have been observed more than once; and possible observer error in recording contents or food consumption. Also, NSLP regulations for nutrients are based on weekly averages, and this study was based on data from selected daily lunches.

More research is needed, and a national study of RSL vs. LBH in elementary schools would be useful to confirm these results. The methodology presented in this paper could be used for additional investigations. Foodservice directors could work with faculty, dietetic students, and dietetic interns.
from colleges and universities to conduct similar studies. Studies that follow children's nutrient intake over a period of time, studies that link health outcomes with nutrition, and cost studies of RSL compared to LBH would be useful.

Children learn about food variety and making healthy food choices through the NSLP. Publicity and marketing efforts should emphasize the superior nutritional quality and convenience of RSL over LBH, simply because RSL is convenient for children and parents. Busy parents, caregivers, and children who pack lunches are looking for convenience foods that will save time. Food manufacturers market to busy parents and offer prepackaged combination lunches and individually packaged drinks and foods. Even with these convenience products, it is difficult to match the nutritional quality of RSL. Wise choices and careful planning are needed for those who wish to obtain the same nutritional quality and variety of foods in RSL. Children, parents, and other caregivers who prepare LBH need education and training on appropriate food choices. Children who bring a lunch from home should be encouraged to purchase milk at school (Stitt & Pilant, 1997). The results of this study provide useful information to school foodservice directors, educators, school administrators, researchers, parents, and children.

ACKNOWLEDGEMENTS
The School Food Service Foundation provided financial support for this research through the ConAgra Fellowship in Child Nutrition. The author wishes to thank Stuart Karabenick for assistance with the research design and data analyses, and the school foodservice directors and their staffs in the two school districts who participated in this study.

REFERENCES
Gjengdahl, M.C., & Seaborn, C.D. (1999). Comparison of cost and selected nutrients of the national school hot lunch, a la carte, and com-

Table 3. Cumulative count of food items in reimbursable school lunches (RSL) and lunches brought from home (LBH) for children in Southeastern Michigan elementary schools

<table>
<thead>
<tr>
<th></th>
<th>RSL n = 281</th>
<th>LBH n = 289</th>
<th>Chi Square p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Items</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero or One</td>
<td>0</td>
<td>6</td>
<td>6.0</td>
</tr>
<tr>
<td>Two or Three</td>
<td>123</td>
<td>156</td>
<td>53.4</td>
</tr>
<tr>
<td>Four or Five</td>
<td>150</td>
<td>122</td>
<td>5.2</td>
</tr>
<tr>
<td>Six or More</td>
<td>8</td>
<td>5</td>
<td>2.8</td>
</tr>
<tr>
<td><strong>Vegetables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td>119</td>
<td>266</td>
<td>42.3</td>
</tr>
<tr>
<td>One</td>
<td>142</td>
<td>22</td>
<td>50.6</td>
</tr>
<tr>
<td>Two or More</td>
<td>20</td>
<td>1</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Fruits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td>111</td>
<td>194</td>
<td>39.5</td>
</tr>
<tr>
<td>One</td>
<td>144</td>
<td>82</td>
<td>51.2</td>
</tr>
<tr>
<td>Two or More</td>
<td>26</td>
<td>13</td>
<td>9.3</td>
</tr>
<tr>
<td><strong>Milk and Dairy Products</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td>18</td>
<td>179</td>
<td>6.4</td>
</tr>
<tr>
<td>One</td>
<td>141</td>
<td>95</td>
<td>50.2</td>
</tr>
<tr>
<td>Two or More</td>
<td>122</td>
<td>15</td>
<td>43.4</td>
</tr>
<tr>
<td><strong>Meat and Meat Alternates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td>108</td>
<td>83</td>
<td>38.4</td>
</tr>
<tr>
<td>One</td>
<td>173</td>
<td>199</td>
<td>61.6</td>
</tr>
<tr>
<td>Two or More</td>
<td>0</td>
<td>7</td>
<td>15.7</td>
</tr>
<tr>
<td><strong>Breads and Grains</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td>18</td>
<td>40</td>
<td>6.4</td>
</tr>
<tr>
<td>One</td>
<td>219</td>
<td>68</td>
<td>77.9</td>
</tr>
<tr>
<td>Two or More</td>
<td>44</td>
<td>181</td>
<td>15.7</td>
</tr>
<tr>
<td><strong>Snack Foods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td>200</td>
<td>78</td>
<td>71.2</td>
</tr>
<tr>
<td>One</td>
<td>72</td>
<td>140</td>
<td>25.6</td>
</tr>
<tr>
<td>Two or More</td>
<td>9</td>
<td>7</td>
<td>3.2</td>
</tr>
</tbody>
</table>

The Journal of Child Nutrition & Management, 25(1) 2001


Acceptability of Lower-Fat Desserts by Pre-Adolescent Children

Peter L. Bordi, PhD; Carolyn U. Lambert, PhD, RD; and Marianne E. Borja, EdD, RD

Food preference testing was used to compare the acceptability of five original U.S. Department of Agriculture (USDA) dessert recipes with new lower-fat recipes. The dessert items tested were oatmeal cookies, brownies, chocolate cake, spice cake, and peanut butter bars. Thirty-five 5th-grade children preferred the lower-fat dessert items to the higher-fat dessert items. The recipes will help school foodservice managers comply with new dietary guidelines for fat and still provide children with flavorful, popular dessert items.

The USDA and the U.S. Department of Health and Human Services (HHS) (1985) reported that many of the nation’s major causes of morbidity and mortality have been linked to the amount of fat present in the American diet. At a USDA-sponsored symposium on childhood obesity, USDA’s then-Under Secretary Shirley Watkins stated that at least one in five children is overweight and that the trend is continuing to grow (1988). The USDA and the HHS issued the Dietary Guidelines for Americans to provide consumers with clear-cut principles for proper eating, with the intention of deterring the causes of morbidity and mortality. Reduction of fat in the American diet is a major goal of the Guidelines. Current recommendations state that fat consumption should be 30% or less of the total calorie intake (USDA, 1995a).

The USDA School Nutrition Dietary Assessment Study (SNDA) (1993) found that children who ate school lunch consumed more calories from fat than children who bought a lunch from home. A study by the Center for Nutrition Policy and Promotion (CNPP) (1999) found that the higher the proportion of calories obtained from protein or fat, the more likely the child would have a high body mass index (BMI). With the School Meals Initiative for Healthy Children (SMI) mandate for planning school lunch menus that meet the Guidelines, the need to identify acceptable, lower-fat products is critical (National School Lunch Program and School Breakfast Program, 1995). Many school foodservice administrators have been struggling to meet the new requirements while providing acceptable foods and maintaining participation in school lunch programs.

A major initiative called “LunchPower” was implemented to help schools develop lower-fat menus that retain acceptability and, in turn, participation. The initiative’s results indicated that “schools could serve meals lower in fat and retain student participation in school lunch” (Snyder, Story, & Trenkner, 1992). Birch (1992) stated that when children are exposed to many high-fat foods, the foods become familiar and are preferred over other foods that remain novel. Davidson (1986) found that a majority of the foods most frequently consumed by 7- to 10-year-old urban children (potato chips, cheese, and peanut butter) contained at least 50% of their energy from fat.

To be accepted by children, lowfat food products must have favorable sensory qualities compared to their higher-fat counterparts. While few research reports were found, the methodologies and findings of these studies were reviewed for their possible implications in the current study. For example, to determine the acceptability of three reduced-fat peanut butter cookies in comparison to their higher-fat counterpart, Swanson (1998) used a panel of 47 school foodservice managers and found that all reduced-fat cookies were rated significantly less acceptable than the high-fat counterpart. She also found that the reduced-fat cookies were liked only slightly by the school foodservice managers themselves, while the control cookie was liked moderately. However, Swanson and Munsayac (1999) found that the substitution of applesauce for 75% of the fat in peanut butter, oatmeal, and chocolate chip cookies produced cookies with softer textures. And chocolate chip cookies made by substituting prune puree for 50% of the fat received similar scores to the regular full-fat cookie.

To examine the acceptability of specific reduced-fat items among children, Mullan, Holton, and Vickers (1996) conducted a study to determine whether children preferred fat-free or full-fat cheese. The results indicated that children did not prefer one to the other. While it has been demonstrated that students will accept some reduced-fat foods, little research has been completed to determine whether they will accept reduced-fat versions of their favorite baked desserts.

A few studies have demonstrated the difficulties of substituting nonfat products for fat in desserts. The fat content...
of foods may be reduced by substituting egg whites for whole eggs, reduced-fat margarine for butter, nonfat yogurt for cream, applesauce or nonfat yogurt for oil in baked desserts, and use such items as apple juice concentrate to enhance sweetness (Kostas, 1997). However, depending on the percentage of fat reduction, the sensory qualities of the final products may not be considered acceptable. For example, Charlton and Sawyer-Morse (1996) illustrated that products low in moisture, such as cookies, are difficult to prepare without fat. In a study on chocolate chip cookies in which fat was reduced to 30% of the original fat, the researchers concluded that people enjoy the texture and flavor imparted to foods by fats and are reluctant to accept lowered-fat foods.

Recent research studies on the acceptability of lower-fat desserts by children have shown positive results. Borja, Bordi, and Lambert (1996) found that reduced-fat dessert items were well accepted by 5th-grade students. No significant differences were found between the higher-fat and lower-fat desserts for the majority of sensory characteristics. Yet, for one item, a chocolate brownie, taste panel results indicated that there was a significant difference at the 0.05 level between the higher- and lower-fat products. Nonetheless, in a ranking test, the majority of participants preferred the lower-fat brownie.

Engell, Bordi, Borja, Lambert, and Rolls (1998) examined the influence that information on fat content had on sensory ratings of two oatmeal cookies by pre-adolescent children. Engell et al. (1998) found that fat content or fat content labeling did not affect the product hedonic ratings. Both cookies were acceptable. When asked to choose which cookie they liked better, information about fat content had a significant effect on cookie preference. Students preferred the cookie with the higher-fat content when no information was given and the lower-fat cookie when information was presented.

To date, research on the sensory attributes and acceptability of lowfat dessert items has pointed toward the need for continued product development and acceptability testing. There are many relevant factors that influence a consumer's decision to purchase and consume a food product, such as price, advertising, and peers. Ultimately, however, a food product must be acceptable in order for it to succeed (Lesser, Hughes, & Marshall, 1986). Lesser et al. (1986) illustrated four categories of sensory testing related to food acceptability: detectability of some difference; the intensity of that difference; the quality, the character or description of the attributes present; and reactions or liking of the product. They also noted the importance of using food acceptability tests appropriate to the target consumers.

The purpose of this study was to determine the acceptability of new lower-fat desserts compared to the higher-fat counterparts by 5th-grade school children participating in the National School Lunch Program (NSLP).

**METHODOLOGY**

**Materials.** The study used food preference testing to determine the acceptance of original USDA recipes and low-fat recipes for five different school lunch desserts: brownies, chocolate cake, spice cake, oatmeal raisin cookies, and peanut butter bars. The investigators selected these dessert items because they are sources of extra fat in the diet and they frequently are found on school lunch menus. Table 1 presents the nutrient content of recipes that were analyzed using FLAS 3.0 (University of Texas Health Science Center) and the USDA Recipe number (USDA, 1995b). Presentation of nutrient information is consistent with the format used in the USDA Tool Kit for Healthy Meals (USDA, 1995b).

According to the Nutrition Labeling and Education Act (1990), a lower-fat product must contain at least 25% less fat than the original product to be labeled fat-reduced, lower-fat, less fat, reduced in fat, or lower in fat. Prior to testing, the fat in the recipes was decreased from the original USDA recipes by 39.5% for chocolate cake, 46.2% for spice cake, 48.7% for brownies, 28.2% for peanut butter bars, and 63.3% for oatmeal raisin cookies. The fat content in recipes

| Table 1. Nutrient content of higher-fat (HF) and lower-fat (LF) desserts |
|----------------------|----------------|----------------|-------------|-------------|---------------|---------------|---------------|---------------|-------------------|-------------------|
|                      | Portion size (g) | Energy (kcal) | Protein (g) | Carb (g) | Fat (g) | % Energy from fat | Saturated Fat (g) | Cholesterol (mg) | Vitamin A (IU) | Vitamin C (mg) | Iron (mg) | Calcium (mg) | Sodium (mg) |
| HF Brownies (C-4)   | 45              | 188           | 3           | 29        | 7.8     | 37.3           | 2.9             | 40.0            | 56            | 0.0            | 1.2          | 31           | 117         |
| LF Brownies (C-21)  | 45              | 134           | 2           | 25        | 3.8     | 26.9           | 0.8             | 0.0             | 4             | 0.0            | 0.9          | 22           | 97          |
| HF Chocolate Cake (C-8) | 61      | 201           | 3           | 30        | 8.1     | 36.3           | 2.9             | 34.0            | 85            | 0.0            | 1.2          | 72           | 198         |
| LF Chocolate Cake (C-31) | 61      | 186           | 4           | 33        | 4.9     | 23.7           | 0.9             | 0.5             | 5             | 0.2            | 1.2          | 64           | 218         |
| HF Spice Cake (C-16) | 60             | 259           | 4           | 30        | 14.3    | 49.7           | 8.5             | 7.0             | 577           | 0.6            | 1.4          | 53           | 92          |
| LF Spice Cake (C-28) | 60             | 198           | 3           | 30        | 7.7     | 35.0           | 1.4             | 0.7             | 341           | 0.6            | 1.3          | 44           | 192         |
| HF Oatmeal Raisin Cookies (C-10) | 49 | 216          | 3           | 30        | 10.7    | 44.5           | 6.2             | 42.0            | 389           | 3.0            | 1.0          | 17           | 62          |
| LF Oatmeal Raisin Cookies (C-25) | 49 | 186          | 3           | 33        | 5.0     | 24.3           | 1.1             | 19.0            | 106           | 0.0            | 1.0          | 18           | 123         |
| HF Peanut Butter Bars (C-12) | 35 | 150          | 4           | 17        | 8.0     | 45.0           | 3.2             | 26.0            | 155           | 0.1            | 0.5          | 25           | 92          |
| LF Peanut Butter Bars (C-25) | 35 | 136          | 3           | 19        | 5.7     | 37.7           | 1.1             | 0.0             | 76            | 0.0            | 0.8          | 30           | 147         |

1USDA Recipe Number
2FLAS kcal values for foods are derived from the actual caloric content of the food as measured in a lab. Therefore, the "calculated" calories for the food using the average values for protein, carbohydrate, and fat (4, 4, and 9) will not match the kcal value exactly.
was reduced either by decreasing the amount of egg yolks, margarine, or butter; increasing the amount of egg whites or plain yogurt; by adding apple sauce; or a combination of these modifications.

**Subjects and Procedures.** The study was conducted in a private school in a mid-sized town in the northeastern region of the United States. Thirty-five 5th-grade children—18 girls and 17 boys, ages 10 to 11—volunteered to serve as subjects. This school was selected because the teachers were interested in improving the diets of children. Following an explanation of the study, each student was given a description of the study and an informed consent form to take home for their parents to sign and return. On the day of testing, students were asked if they wished to participate. Students who declined to participate were allowed to read or work on other assignments.

The investigator trained the students to use the food preference sensory evaluation instrument through demonstration, discussion, and application. Each characteristic on the scale was thoroughly discussed with the students. For example, the term *texture* was defined and examples of foods with different textures were provided. The same investigator trained the children and conducted the tasting sessions. The children were not informed that the fat content of the two products tested was different. The children used a nine-point combination standard hedonic-face scale (1—dislike extremely, 5—neither like nor dislike, and 9—like extremely) to evaluate overall product acceptability, appearance, flavor, and texture. Stone and Sidel (1993) found that a nine-point hedonic scale is reliable when working with children age 8 years and older who are able to read and understand the meaning of words.

After completing the hedonic scale, children ranked the products as first or second on the instrument. The students sampled the original higher-fat and lower-fat products for two to three menu items per tasting session over a period of four weeks. The order of presentation of lower- or higher-fat samples to the students was randomized and balanced. The investigator served the samples at room temperature on white, plastic plates. The testing area was quiet, comfortable, and free of any food preparation odors.

The statistical procedures for analyzing data included performing a two-sample t-test to compare the higher-fat and lower-fat products for overall acceptability, appearance, flavor, and texture. These data were analyzed using PC Minitab for Windows, Version 10 (Minitab Inc., 1995).

**RESULTS AND DISCUSSION**

Results indicated that the children found a significant difference (p<0.05) between the original and lower-fat oatmeal raisin cookies on all four sensory characteristics (Table 2). For the other desserts, the textures of the original and lower-fat chocolate cake, spice cake, and peanut butter bars were found to be significantly different (p<0.05). No significant differences were found between the appearance and overall acceptability for these original and lower-fat desserts. These results appear to indicate that the majority of the sensory qualities of lower-fat products were not considered to be different from the original products.

Based on the ranking data (Table 3), all five lower-fat desserts were preferred over the higher-fat desserts. The highest preference was found for lower-fat oatmeal raisin cookies, with 25 of 30 students indicating that they preferred the lower-fat product. The lower-fat chocolate cake was only preferred by 19 of 30 students. Although these findings are preliminary, they seem to indicate that the students preferred the new lower-fat recipes.

These results may indicate that acceptance of lower-fat products depends upon the specific ingredients used to lower the percentage of fat. In this study, apple sauce, egg whites, and yogurt were used. These ingredients do not impart strong flavors or increase the moisture level. Swanson and Munsayac (1990) reported that using prune puree as an ingredient may be one reason for lowered product acceptability. Expecta-

---

### Table 2. Mean scores and significant differences for sensory characteristics of higher-fat (HF) and lower-fat (LF) recipe items

<table>
<thead>
<tr>
<th>Menu Items</th>
<th>Overall Acceptability</th>
<th>Appearance</th>
<th>Texture/Flavor</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>HF Brownies</td>
<td>7.5</td>
<td>8.1</td>
<td>7.4</td>
<td>7.2</td>
</tr>
<tr>
<td>LF Brownies</td>
<td>7.7</td>
<td>8.3</td>
<td>7.7</td>
<td>7.7</td>
</tr>
<tr>
<td>HF Chocolate Cake</td>
<td>7.2</td>
<td>7.8</td>
<td>7.2</td>
<td>7.3</td>
</tr>
<tr>
<td>LF Chocolate Cake</td>
<td>7.7</td>
<td>7.6</td>
<td>7.9*</td>
<td>7.8*</td>
</tr>
<tr>
<td>HF Spice Cake</td>
<td>6.9</td>
<td>7.3</td>
<td>6.8</td>
<td>7.3</td>
</tr>
<tr>
<td>LF Spice Cake</td>
<td>7.7</td>
<td>7.6</td>
<td>7.6</td>
<td>8.0*</td>
</tr>
<tr>
<td>HF Oatmeal Raisin Cookies</td>
<td>6.8</td>
<td>6.8</td>
<td>6.7</td>
<td>6.7</td>
</tr>
<tr>
<td>LF Oatmeal Raisin Cookies</td>
<td>7.9**</td>
<td>7.6**</td>
<td>8.0**</td>
<td>7.3*</td>
</tr>
<tr>
<td>HF Peanut Butter Bars</td>
<td>7.2</td>
<td>7.8</td>
<td>7.2</td>
<td>7.0</td>
</tr>
<tr>
<td>LF Peanut Butter Bars</td>
<td>7.5</td>
<td>7.8</td>
<td>7.5</td>
<td>7.8*</td>
</tr>
</tbody>
</table>

Mean score for overall acceptability, appearance, flavor, and texture/consistency based on evaluation by subjects on possible scores of 1 to 9 (1—dislike extremely; 9—like extremely).

Significant results of two-sample t-test on the higher-fat and lower-fat recipe items:

*Indicates significance at the (<0.05) level

**Indicates significance at the (<0.01) level
Table 3. Ranking for lower-fat and higher-fat desserts

<table>
<thead>
<tr>
<th>Dessert</th>
<th>Ranking</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oatmeal Cookies</td>
<td>Both Products Equal</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Preferred Lower Fat</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Preferred Higher Fat</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30</td>
</tr>
<tr>
<td>Brownies</td>
<td>Both Products Equal</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Preferred Lower Fat</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Preferred Higher Fat</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>33</td>
</tr>
<tr>
<td>Chocolate Cake</td>
<td>Both Products Equal</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Preferred Lower Fat</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Preferred Higher Fat</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30</td>
</tr>
<tr>
<td>Spice Cake</td>
<td>Both Products Equal</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Preferred Lower Fat</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Preferred Higher Fat</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>32</td>
</tr>
<tr>
<td>Peanut Butter Bars</td>
<td>Both Products Equal</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Preferred Lower Fat</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Preferred Higher Fat</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>33</td>
</tr>
</tbody>
</table>

should be viewed as preliminary. This population was readily available to the researchers and had been found to be cooperative and willing to provide truthful opinions. Additionally, the need to have a consistent product limited the number of portions available. In future studies, the number of students should be increased.

REFERENCES


University of Texas Health Science Center. (1996). Food intake analysis system (Version 3.0) [Computer software]. Houston, TX: Houston School of Public Health.
Factors Influencing Indiana School Foodservice Directors/Managers’ Plans to Implement a Hazard Analysis Critical Control Point (HACCP) Program

Joyce Hyunjoo Hwang, MS; Barbara A. Almanza, PhD, RD; and Douglas C. Nelson, PhD

The purpose of this research was to determine what the Indiana school foodservice directors’ or managers’ (SFMs) plans were to implement Hazard Analysis Critical Control Point (HACCP) programs in their facilities. Factors that influenced plans to implement a HACCP program were determined, including SFMs’ concern for an outbreak, sanitation knowledge, and sanitation certification. Other factors studied that were related to the operations included availability of sanitation training programs for employees, sanitation practices, size, and inspection scores. A written questionnaire was developed to measure these factors.

A total of 447 questionnaires were mailed to all SFMs in school operations in Indiana, followed by a reminder postcard one week later. One hundred sixty-two responses were returned for a 36.2% response rate. The Spearman Rho Non-parametric Correlation coefficient was used to identify associations between SFMs’ plans to implement HACCP and their concern for a foodborne outbreak, sanitation knowledge, sanitation certification, the operation’s training program, sanitation practices, size, and inspection scores. The variable “stage” of plans to implement HACCP estimated how likely SFMs were to implement a HACCP program in their facilities by considering their awareness, plans to implement, and interest in implementing a HACCP program.

Most of the SFMs (96.5%) were aware of HACCP. Among them, 22 SFMs said they had a HACCP program set up in their operation. Of the remaining 82 operations that did not have a HACCP program, 40 SFMs had plans to start one in the near future, and 42 SFMs did not have such a plan. Of the SFMs without immediate plans to implement a HACCP program, 30 SFMs were interested in implementing one in their operation and 12 were not.

Each level of SFMs’ sanitation knowledge, certification, sanitation training program availability, sanitation practices, and size had a significant positive relationship with SFMs’ plans to implement HACCP programs. This may suggest that HACCP will be started first in larger school foodservice operations with a sanitation training program and a certified manager with better sanitation knowledge and practices. Additionally, the low implementation rate for a HACCP program, around 14%, indicates that HACCP needs to be a focus for continuing education opportunities for SFMs.

It is estimated that there are 76 million cases of foodborne illness in the United States each year, resulting in 325,000 hospitalizations and 5,000 deaths (Mead et al., 1999). According to the Centers for Disease Control and Prevention (CDC), bacteria caused 79% of the reported outbreaks between 1988 and 1992, in which etiology was identified (CDC, 1996). The leading factors contributing to reported foodborne outbreaks were improper holding temperature, followed by poor personal hygiene, inadequate cooking, contaminated equipment, and food from unsafe sources (CDC, 1990). In fact, from 1990 to 1994, the most commonly reported locations for foodborne outbreaks were restaurants, followed by homes and schools (Adero, Brown, & Anderson, 1999).

Preventing foodborne illness is a complicated process for which there is no simple solution (Tauxe, 1997). In 1992 and 1993, incidents of outbreaks of acute gastrointestinal illness among 142 people in Mississippi and 300 people in Alabama indicate that the traditional inspection and compliance may not be enough to prevent foodborne outbreaks. The restaurant in Alabama had passed four public health inspections, including one just two days before the buffet was served that caused the outbreak. Also, the hotel kitchen in Mississippi had no previous recorded violation except one.
failure to pass a routine inspection 11 days prior to the reception that caused the outbreak (Penman, 1996).

In a report to President Clinton by the Food and Drug Administration (FDA), the U.S. Department of Agriculture (USDA), the U.S. Environmental Protection Agency (EPA), and the CDC in 1997, the limitations of current regulation were specifically pointed out, as was the need for a more effective program that can detect and stop outbreaks before they occur (FDA et al., 1997).

HACCP is gaining wide recognition because the process focuses on identifying problems before they take place, and establishing measures for control at those stages in production that are critical to ensuring food safety (Notermans, Gallahoff, Zwieitering, & Mead, 1995). The USDA’s Food Safety and Inspection Service (FSIS) issued a final rule called “Pathogen Reduction; Hazard Analysis and Critical Control Point Systems,” and required meat and poultry plants to implement HACCP programs to improve product safety, beginning with large facilities by January 27, 1997, and small-sized facilities by January 25, 2000 (FSIS, 1998).

Additionally, the 1999 Food Code recommends that states require HACCP plans before granting a permit to foodservice operations employing specialized processing and storage procedures. The code went even further, recommending that health inspectors use HACCP-based inspection criteria (FDA, 1999). In support of the move to implement HACCP programs in foodservice operations, FDA also published A HACCP Principle Guide for Operators of Food Establishments at the Retail Level (FDA, 1998). School foodservice operators most likely will not be exempt from implementing HACCP programs.

School foodservice operations have not been an exception to outbreaks of foodborne illnesses. In 1986, there was an outbreak in a small Oklahoma community that originated from chicken contaminated by Salmonella; the chicken was thawed and held improperly (CDC, 1987). Another salmonellosis outbreak involved turkey that was handled by an asymptomatic worker and held improperly (CDC, 1985). In May 1990, there was a staphylococcal outbreak in a Rhode Island school’s centralized kitchen program caused by turkey that was improperly held, handled, and reheated (Richards et al., 1993). And in 1997, eight outbreaks resulting from food served by school foodservices were reported to the CDC (General Accounting Office, 2000).

According to a study assessing sanitation knowledge, attitudes, and behaviors (Hsu & Huang, 1995), foodservice workers in Big Ten universities had a satisfactory level of sanitation knowledge and overall positive attitudes toward foodservice sanitation. Also, they were reported to have proper personal hygiene and inventory food handling behaviors. However, the workers’ sanitation knowledge was weakest in the area of microorganisms. Hsu and Huang (1995) suggested that employee training be conducted for managers and employees on a regular basis. According to another case study, school foodservice employees had limited HACCP knowledge (Blakeslee & Penner, 1999).

Clearly, more research needs to be conducted on SFMs’ plans to implement HACCP programs. This study was undertaken to meet that need and to identify factors related to HACCP implementation. Variables that were expected to impact SFMs’ plans to implement HACCP included SFMs’ level of concern for an outbreak, sanitation knowledge, sanitation certification, the operation’s sanitation training program for employees, sanitation practices, size, and inspection scores.

METHODOLOGY
Research Instrument. A questionnaire was developed to measure:
- SFMs’ plans to implement HACCP;
- SFMs’ concern for being responsible for a foodborne outbreak;
- SFMs’ sanitation knowledge;
- SFMs’ certification in food safety;
- The availability of a sanitation training program for employees;
- The operation’s sanitation practices;
- The size of the operation; and
- The operation’s inspection scores.

In addition, the questionnaire asked SFMs about obstacles in implementing a HACCP program. Questionnaire items were combined to create variables that indicated the SFMs’ plans to implement HACCP in their operation, the degree of SFMs’ concern for an outbreak in their operation, the level of the SFMs’ sanitation knowledge, the availability of a sanitation training program for employees, and the operations’ sanitation practices.

SFMs’ plans to implement HACCP were categorized into five stages: 0=SFM were unaware of HACCP; 1=SFM were aware of HACCP, but not interested in implementing a HACCP program; 2=SFM were aware of HACCP and interested in implementing a HACCP program; 3=SFM planned to implement a HACCP program within five years; and 4=SFM who had a HACCP program in their operation.

The level of SFMs’ concern for a foodborne outbreak was measured combining three concern-related questions. The three questions involved: the SFMs’ estimated likelihood of a foodborne outbreak in their facilities; the SFMs’ perceptions of the importance of sanitation in their operation on a 5-point scale; and satisfaction with their employees’ sanitation practices on a 5-point scale. These three questions created nine possible concern scores. Concern for an outbreak was scored either 0=without concern, 1=with concern, and perceptions of the
Research in Action

<table>
<thead>
<tr>
<th>Stages</th>
<th>Description</th>
<th>Number of SFMs</th>
<th>Percentage of SFMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0</td>
<td>Don't know about HACCP</td>
<td>54</td>
<td>33.5</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Know about HACCP and don’t have HACCP and don’t have plans to implement HACCP and not interested in implementing HACCP</td>
<td>12</td>
<td>7.4</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Know about HACCP and don’t have HACCP and don’t have a plan to implement HACCP but interested in implementing HACCP</td>
<td>30</td>
<td>18.7</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Know about HACCP and don’t have HACCP but have a plan to implement HACCP in near future</td>
<td>40</td>
<td>26.7</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Know about HACCP and have HACCP</td>
<td>22</td>
<td>13.7</td>
</tr>
</tbody>
</table>

Note: Three respondents did not specify stage.

Table 3. Training, concern, knowledge, and practice scores by plan to implement a HACCP system (Stage)

<table>
<thead>
<tr>
<th>Possible points</th>
<th>Training</th>
<th>Concern</th>
<th>Knowledge</th>
<th>Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.9 ± 1.9</td>
<td>75 ± 13</td>
<td>65 ± 18</td>
<td>6.6 ± 2.4</td>
</tr>
<tr>
<td>Stage 1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.3 ± 1.6</td>
<td>78 ± 0.9</td>
<td>71 ± 1.7</td>
<td>6.8 ± 1.7</td>
</tr>
<tr>
<td>Stage 2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.2 ± 1.9</td>
<td>74 ± 1.2</td>
<td>71 ± 1.7</td>
<td>6.3 ± 2.3</td>
</tr>
<tr>
<td>Stage 3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.0 ± 1.9</td>
<td>78 ± 0.9</td>
<td>71 ± 1.5</td>
<td>7.5 ± 1.7</td>
</tr>
<tr>
<td>Stage 4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.5 ± 1.6</td>
<td>77 ± 1.2</td>
<td>75 ± 1.2</td>
<td>8.5 ± 1.5</td>
</tr>
</tbody>
</table>

Spearman Rho Coefficient:
- Training: 0.21
- Concern: 0.26
- Knowledge: 0.20
- Practice: 0.27

Probability:
- 0.00

*Training: Availability and frequency of employee training
*Concern: Level of SFMs’ concern for a foodborne outbreak measured by three concern-related questions
*Knowledge: Points awarded by number of correct responses to nine sanitation-knowledge questions
*Practice: Points awarded by number of correct responses to 10 sanitation-practice questions

The proportion of full-time employees who had sanitation certification (0 to 3). The possible score for availability of training programs was 6. Combining 10 sanitation practice-related questions created the operations’ sanitation practice score. SFMs were asked frequencies of checking temperatures of finished products and holding equipment.

The number of lunches and breakfasts served per day in the school foodservice operation indicated the size of the operation. Inspection scores included the two latest inspection scores as reported by the SFMs in the questionnaire. The variables and their possible scores are summarized in Table 1.

Sample and Data Collection. Questionnaires were sent to each manager or director in all 447 Indiana school operations. The mailing labels were obtained from the Indiana State Department of Education. The questionnaire, a cover letter, and a business reply envelope were mailed. A follow-up post card with a thank-you note and a reminder to return the survey was sent a week later.

Data Analysis. Data were entered using Paradox and analyzed with Statistical Analysis System (SAS 6.12) using the Spearman Rho Nonparametric Correlation, a test that assigns a rank in its own group or within the same variable. Spearman’s coefficient of rank correlation (R) is then computed. This estimates the association between X and Y by measuring the degree of agreement between rankings (Gibbons, 1971). This method was used to find any association between SFMs’ plans to implement HACCP and their concerns for an outbreak in their operation, knowledge, certification, the operation’s training program, sanitation practice, size of the operation, or inspection scores.

RESULTS AND DISCUSSION

Of the 447 questionnaires, 162 responses were returned for a 36.2% response rate. One of the responses could not be used for the analysis because of incomplete sections and errors. As a result, 161 responses were used for the analysis.

SFMs’ Plans to Implement HACCP

Most of the SFMs (107 or 66.5%) were aware of HACCP. Of the SFMs who knew of HACCP, 22 had a HACCP program, while 85 did not. Of the remaining 85 SFMs who had heard of HACCP but did not have the program, about...
half had plans to set up a program within five years. The 42 remaining SFMs had no immediate plans to set up a HACCP program. Among the SFMs without an immediate plan, 30 were interested in implementing HACCP and 12 were not. Table 2 shows respondents' plans to implement a HACCP program.

SFM's Perceived Obstacles to Implementing HACCP. SFMs were asked to rate obstacles to HACCP implementation. They were rated on a 5-point scale: 1=no concern; 2=small concern; 3= somewhat of a concern; 4=moderate concern; and 5=huge concern. The three greatest concerns were time to first establish the HACCP program, time to run the HACCP program on a daily basis, and labor cost to run the HACCP program on a daily basis. Other obstacles mentioned were lack of training funds, time to get used to running the HACCP program, and union problems.

SFM's Concern for an Outbreak. Forty-four (27.3%) of the 161 SFMs thought that their operations had a zero chance of a foodborne outbreak. Ninety-three SFMs (57.3%) thought that they had some possibility of a foodborne outbreak in their operation. Twenty-four SFMs did not respond.

One hundred twenty-seven (78.9%) SFMs said sanitation was "extremely important" to the operation, followed by 32 SFMs (19.9%) saying it was "very important." One SFM said sanitation was not important to the operation. One SFM did not answer the question. Most SFMs were extremely satisfied (45%) or moderately satisfied (48%) with their employees' sanitation practices. Nine SFMs were not satisfied with their employees' sanitation practices and five SFMs were neither dissatisfied nor satisfied with their employees' sanitation practices.

Training Programs and Certification. The majority of school foodservice operations (62%) had a sanitation training program for employees. When developing the program, the most common source of information was the operation itself, followed by the local health department and extension programs. Some had more than one source. Other sources mentioned were the Indiana School Food Service Association (ISFSA), the Indiana State Department of Education, the National Restaurant Association (NRA), the American School Food Service Association (ASFSA), videotapes, and other private companies. The certification sources most frequently mentioned were the Indiana Department of Education, NRA, the local health department, ASFSA, and ISFSA.

Sixty (37.3%) of the 161 operations had no employee who was certified in food safety. Twenty-eight operations had 1% to 25% of their employees certified, 16 operations had 26% to 50%, seven operations had 51% to 75%, and 23 had 76% to 100%. Among the 161 SFMs, 87 (55.1%) said that they were certified food-handlers and 71 (44.9%) said they were not. Three SFMs did not respond to this question.

A large number of missing data points (27) was noted regarding the percentage of certified school foodservice employees. This may suggest that there may be more operations with a low ratio of certified employees, or this may have been because SFMs do not keep track of whether their employees are certified.

Relationship of Training, Concerns, Knowledge, and Practices With Plans to Implement HACCP. Table 3 shows the mean scores for SFMs' levels of concern for foodborne outbreaks (concern), sanitation knowledge (knowledge), availability of training programs (training), and sanitation practices (practice) by stage of plans to implement a HACCP program. As the scores for knowledge, training, and practice increased, the trend was for the operation to move to the next HACCP implementation stage. The results of the Spearman Rho nonparametric correlation test showed that the relationship between level of concern for an outbreak (concern) and SFMs' plans to implement a HACCP program (stage) was not significant. By contrast, availability of sanitation training programs (training), SFMs' level of sanitation knowledge (knowledge), and practices (practice) had a significant relationship with the stage in plans to implement HACCP. This may suggest that SFMs with training programs and better sanitation knowledge and practices are more likely to be at a higher stage in plans to implement HACCP (Table 3).

Inspection scores did not seem to change with stage of plans to implement a HACCP program, although missing data are noted as a limitation for this study. This may suggest that operations with high inspection scores may have been more likely to report their scores. In addition, some of the school foodservice operations were not under the traditional 100-point scale inspection system. The size of the operation, based on the...
number of lunches and breakfasts served per day, did have a significant relationship with plans to implement HACCP. SFMs from larger operations appeared to be more likely to implement HACCP (Table 4).

SFM's certification in food safety had a significant relationship with stage of plans to implement a HACCP program (R = 0.4457, P = 0.0001). Food sanitation certification should be highly encouraged and SFMs should be informed about the various sources for certification programs.

CONCLUSIONS AND APPLICATION

Most operations (62%) had an ongoing employee sanitation training program. Availability of a sanitation training program had a significantly positive relationship with SFMs' plan to implement a HACCP program. As Cochran-Yantis et al. (1996) said, "Education is a critical factor in implementing a food safety program." Development of a sanitation training program is highly encouraged for school foodservice operations as a basis for good food safety practices. Many sanitation resources are available to Indiana SFMs to help in development of a sanitation training program, including the Indiana Department of Education, ASFSA, NRA, extension offices, and local health departments. This study found that not all SFMs appeared to be aware of or were taking advantages of those opportunities for assistance.

Closely tied to training is knowledge and practices. In a report to President Clinton in 1997 (FDA et al., 1997), food safety knowledge was said to be an essential factor in the reduction of foodborne illness. SFMs with better sanitation knowledge and practices were more likely to implement HACCP. A little more than half of the SFMs were certified food handlers although the sources of certification varied. However, 44.9% of the Indiana SFMs were not certified food handlers in sanitation. While certification is not required in the state of Indiana (Indiana State Department of Health, 2000), certification appears to be highly correlated with SFMs' plans to implement HACCP. Therefore, increasing the number of certified food handlers among SFMs should increase the number of HACCP programs in Indiana public schools. It was very positive that nearly 99% of the SFMs in Indiana who responded to the survey felt that sanitation is very to extremely important.

This suggests that this group as a whole may be highly interested or motivated to follow good sanitation practices.

About 33% of the SFMs had not yet heard of HACCP. This is important to determine because both the U.S. Department of Health and Human Services' Food and Drug Administration (FDA) and the USDA are moving toward the incorporation of HACCP as a science-based preventative measure for the entire foodservice industry. School foodservice directors soon may need to prepare for HACCP. Of the 67% of the SFMs who were aware of HACCP, only half were planning to set up a HACCP program. Larger operations were found to be more likely to implement HACCP than small operations.

Time to first establish the HACCP program and to run HACCP on a daily basis were the greatest concerns among SFMs, followed by the labor cost to establish and run the program. Examples of useful resources to speed implementation would include sample forms for HACCP record-keeping and sample recipe formats. A more efficient network among SFMs who wish to implement a HACCP program should be developed.

Although this study did reveal several interesting correlations related to implementation of HACCP in school foodservice, it was limited due to the area in which the surveys were disseminated in Indiana, as well as the low response rate (36.2%) that was received. This study provides the basis for a nationwide study on the implementation of a HACCP program in school foodservice. It also highlights the need for further review of various sanitation certification sources and a detailed assessment of training needs of school foodservice employees with regard to HACCP implementation.

ACKNOWLEDGEMENTS

This study was a result of a research project sponsored by the Indiana State Department of Education. Statistical analysis was performed with guidance from the Department of Statistics at Purdue University, West Lafayette, Ind.

REFERENCES


Indiana State Department of Health. (2000). Retail food establishment sanitation requirements (Title 410 IAC 7-20). Indianapolis, IN.


The impact of participation, revenue, and expenditures on the financial self-sufficiency of meal programs was evaluated for Kansas public school districts. Financial self-sufficiency was defined as (total annual revenue - total annual expenses) / total annual net general funds transfers ≥ 0. Audited, monthly, reimbursement-claim forms from the districts for the 1997-98 school year were analyzed using logistic regression to predict financial self-sufficiency for programmatic performance ratios. Significant predictors were labor cost, government reimbursement, student payments for reimbursable meals, and other income as percents of revenue. Revenue source variables were related positively, whereas cost percentages were related negatively to the achievement of success. Schools with enrollments of less than 400 were unable to break even or make a profit, but as enrollment increased, the percentage of schools able to achieve financial success increased.

Mean values of successful districts by size were proposed as financial benchmarks. Comparison of successful districts with enrollments of 401 to 1,300 and >1,300 indicated that lunch and breakfast participation overall and within the free, reduced, and paid categories were lower for larger districts. Larger districts depended more upon government reimbursement income and other sales, and districts with enrollments of 401 to 1,300 depended more upon student payments for reimbursable meals. Food costs were lower for larger districts, but still higher than recommended levels. Larger programs were able to achieve higher profitability levels. Attention to significant predictors of financial self-sufficiency can assist districts in moving toward a break-even or profit situation. However, achievement of financial self-sufficiency will require intentional changes in operations management of school meal programs and district policies.

Breakfast and lunch programs served more than 20 million children in 93,700 schools during fiscal year 1997. These programs received $5.7 billion of federal funds during fiscal year 1997-98 (Food and Nutrition Service, 1999a,b). Maximum lunch reimbursement increased from $1.89 to $1.94 in the contiguous states for the 1998-99 school year (Food and Nutrition Service, 1999c) in an attempt to compensate for escalating program costs that were reported to exceed program revenue by 2 cents per meal (St. Pierre et al., 1991).

Changes in educational funding allocation and continued demands to provide students with technology and programmatic opportunities place pressure on district budgets. School districts are less able to subsidize meal programs that are operating at a loss than they were in previous years (Decker, Mulheirn, Sluder, & Watford, 1992; Stainbrook, 1991).

Prior research on financial management of school meal programs is limited. Wilson and Alkire (1995) initiated a study on financial self-sufficiency indicators based on survey responses from 103 districts with low federal assistance levels. Choices for reimbursable meal components were found to have a negative impact on profitability (p=0.043). The use of satellite distribution was observed more often in districts with positive financial outcomes (p=0.076). The self-report study yielded inconclusive results concerning menu offerings and financial outcomes, but the preliminary findings and authors’ recommendations invited further investigation.

Sanchez, Gould, and Sanchez (1998) evaluated financial tools used by school foodservice directors. The tools used most often were profit and loss statements, labor costs, meals per labor hour, labor cost per meal, food cost per meal, food cost, and break-even point. Cater and Mann (1997) discussed four case studies analyzing financially successful programs and found several operational commonalities. Successful programs employed directors who were self-motivated, who initiated change, who were experienced in foodservice management or business, and who were responsible for program management. Financial reports, modified accrual accounting methods, and com-
puterization of record-keeping tasks increased efficiency in assessing financial outcomes. Revenue and expenses were monitored intentionally and adjusted to improve performance. Other studies have looked at certain components impacting the financial status of an operation, including purchasing (Hiemstra, Poo, & Jaffe, 1996; Boudreaux & Oldenquist, 1996; Durham & Babb, 1997) and employee scheduling (Tart & Taylor, 1997).

District directors have placed a lower priority on the financial management of child nutrition programs because of competing issues. Directors ranked continuing education needs of program compliance and quality above cost issues (Sneed & White, 1993). Although directors and managers indicated food cost always to be a factor in menu planning, program costs that also impacted program financial outcomes were ranked lower (Williams, Gregoire, Canter & Shanklin, 1997). Lack of training and administrative time has led to privatization of programs in districts viewing their primary mission as educating students (U.S. General Accounting Office, 1996; Donovan, 1996).

Financial management issues currently receive research priority through the National Food Service Management Institute (NFSMI) (Conklin, 1996). NFSMI has proposed a uniform financial-management information system to improve reporting consistency and increase comparability of financial data among districts (Conklin & Cater, 1998). No studies were found in the literature that attempted to evaluate differences between financially self-sufficient school meal programs and those not achieving self-sufficiency. This study evaluated financial indicators differentiating solvency outcomes in Kansas school meal programs. Financial performance benchmark ratios based on school district size for Kansas programs also were proposed.

**METHODOLOGY**

**Research Design.** A cross-sectional survey of audited, state-programs, data-report forms capturing the independent variables concerning revenue, participation, and expenditures were evaluated. The dependent variable, financial self-sufficiency, was defined as the lack of reliance on transfers from the district general fund to the school foodservice operating budget to achieve break-even or profit ($\Sigma$ annual revenue - $\Sigma$ annual expenses - $\Sigma$ district general funds transfers) $\geq 0$.

**Sampling and Data Collection.** A sample of 150 Kansas public school districts participating in federal school meal programs was selected using probability proportional to size techniques. The districts' monthly reimbursement-claim forms for the 1997-98 school year were obtained from the Division of Fiscal Services and Quality Control of the Kansas State Department of Education. The independent auditors' statement was checked to verify the accuracy of monthly claim forms. Monthly data were summed to yield annual figures. An Excel spreadsheet was designed to include district size, participation rates, program revenue, and program costs. The percentage of costs to total revenue was calculated within the spreadsheet. Performance ratios of expenditure composition, costs/revenue, participation rates, meal pricing, and profitability also were calculated within the spreadsheet. Approval to conduct the study was obtained from the Institutional Review Board of Kansas State University and the Division of Fiscal Services and Quality Control, Kansas State Board of Education.

**Pilot Study.** A pilot study was conducted using data from the 1996-97 school year. Monthly reimbursement forms from 16 districts selected through probability proportion sampling were analyzed to determine needed changes in the study design or analysis.

**Data Analysis.** Data were analyzed using the SAST (Ver. 6.12, 1989-96) and SPSS (Ver. 10, 1999) software packages. Central tendencies and variability were reported for each variable. A step-wise logistic regression model to predict the ability to break-even included financial performance ratios and participation levels. Logistic regression allows prediction of a discrete or dichotomous outcome (yes/no) using one or more independent variables. What are being predicted are the odds of an event (in this case, failure) occurring. The odds ratio is defined as the probability of (event)/probability (no event). To satisfy the testing for the null hypothesis, the odds of failure are tested rather than the odds of success. Odds ratios greater than 1 indicate that higher values of the independent variable(s) are associated with higher odds of failure, and odds ratios less than 1 indicate that higher values of the independent variable(s) are associated with lower odds of failure. Thus, odds ratios are more likely to be significant to the extent they depart from 1 in either direction (Tabachnick & Fidell, 1995).
District data variables were sorted into three size groups based on Kansas’ head-count enrollment categories (201 to 400, 401 to 1,800, >1,800) and compared by enrollment using multivariate analysis of variance (Otting, 1997). Means for each independent variable for financially self-sufficient districts were proposed as benchmarks according to district size. Use of means agrees with standard benchmarking practices (Dopuch & Gupta, 1997), which rely on aggregate quantitative internal or external data (El Nathan, Lin, & Young, 1996; Agresti & Finlay, 1997).

RESULTS AND DISCUSSION

Sample Description. Table 1 illustrates enrollment and participation data for the 150 school districts. Average head count was 13,211. The smallest district had an enrollment of 290 and the largest had 46,507 students. Kansas districts are typically small with an average head-count enrollment of 1,642 (Kansas State Department of Education, 1997). Overall participation rates defined as total number of breakfasts or lunches divided by total enrollment were 13% for breakfast and 57% for lunch.

Average total revenue for a school meal program in Kansas was $3,482,643. The smallest district earned revenue of more than $100,000, and the largest programs brought in more than $11.5 million. These dollars represent a significant cash inflow to the district. Transfers of general funds into the program averaged $119,056 ± 179,801, with a range of $0 to $622,821.

As evident from Table 2, 42% of program revenue was derived from federal/state funds, 35% from student payments, 15% from other sources, and 8% from district transfers. “Other” funds refer to à la carte, adult meal sales, and catering revenue outside of the meal program. These data indicate that other sources of income could be enhanced to reduce district transfer amounts. District transfers from general funds as a percent of revenue ranged from 0% to 44%. The amounts of these transfers indicate the level of funds diverted from other district activities and interest from idle meal program funds.

Food and labor were 47% and 43% of expenses, respectively. Other direct costs averaged 5%, and indirect costs 2%. Profit margin without general funds transfer averaged -5.6% ± 11.55%. Districts are obligated to ensure program solvency, and they will transfer general funds when programs experience losses (Kansas State Department of Education, 1998). Zero values for food, labor, and direct costs were found in districts employing outside contractors for meal services. Many districts did not buy equipment during the school year. This may have been due to deficits in labor, food, and direct costs. Indirect costs averaged $39,415 ± 49,498. The wide variance and zero values coincide with the policy that the calculation of indirect costs for meal programs is optional for Kansas districts (Kansas State Department of Education, 1998).

Predicting Factors impacting Financial Self-Sufficiency. Results of logistic, forward-selection, stepwise, model building (Table 3) indicate that revenue sources from government reimbursement (p=0.02), student reimbursable sales (p=0.021), and

Table 2. Percentages of revenues and expenses for meal programs in 150 school districts in Kansas

<table>
<thead>
<tr>
<th>Financial Indicator</th>
<th>Mean %</th>
<th>SD %</th>
<th>Range %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal/state</td>
<td>42.2</td>
<td>17.3</td>
<td>14.2-73.2</td>
</tr>
<tr>
<td>Student</td>
<td>35.1</td>
<td>13.0</td>
<td>15.1-80.1</td>
</tr>
<tr>
<td>Other</td>
<td>15.2</td>
<td>11.0</td>
<td>0.1-42.8</td>
</tr>
<tr>
<td>District transfers</td>
<td>7.5</td>
<td>9.8</td>
<td>0.0-43.7</td>
</tr>
<tr>
<td>Expenses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>47.4</td>
<td>6.1</td>
<td>0.0-66.4</td>
</tr>
<tr>
<td>Equipment</td>
<td>2.3</td>
<td>2.2</td>
<td>0.0-18.3</td>
</tr>
<tr>
<td>Contract</td>
<td>0.7</td>
<td>7.5</td>
<td>0.0-91.0</td>
</tr>
<tr>
<td>Labor</td>
<td>42.9</td>
<td>5.8</td>
<td>0.0-57.9</td>
</tr>
<tr>
<td>Other direct</td>
<td>4.6</td>
<td>2.3</td>
<td>0.0-13.4</td>
</tr>
<tr>
<td>Indirect</td>
<td>2.0</td>
<td>2.8</td>
<td>0.0-10.8</td>
</tr>
<tr>
<td>%Profit*</td>
<td>-5.6</td>
<td>11.6</td>
<td>-44.7-9.4</td>
</tr>
</tbody>
</table>

*Represents profit margin without general funds transfer

Table 3. Performance factor predictors and parameter estimates of meal program financial success in Kansas schools* using break-even analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio</th>
<th>Beta</th>
<th>Std Error</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.000</td>
<td>43.501</td>
<td>19.909</td>
<td>0.029</td>
</tr>
<tr>
<td>Labor cost as percent of revenue</td>
<td>1.111</td>
<td>0.105</td>
<td>0.060</td>
<td>0.078</td>
</tr>
<tr>
<td>Other income as percent of revenue</td>
<td>0.629</td>
<td>-0.479</td>
<td>0.200</td>
<td>0.021</td>
</tr>
<tr>
<td>Total government reimbursement as percent of revenue</td>
<td>0.617</td>
<td>-0.483</td>
<td>0.208</td>
<td>0.020</td>
</tr>
<tr>
<td>Reimbursable meal income as percent of revenue (student portion)</td>
<td>0.620</td>
<td>-0.476</td>
<td>0.206</td>
<td>0.021</td>
</tr>
</tbody>
</table>

*Financial success = Σ total annual revenue - Σ total annual expenses - Σ total net transfer of district general funds) ≥0

*Results of stepwise logistic regression; n=150 school districts
other income \((p=0.021)\) were significant positive predictors of financial success or negative predictors of failure. \(p=0.07\) of a successful financial outcome.

An odds ratio of 1 represents a neutral point, meaning that the odds of failure stay the same when multiplied by 1. Departures from 1 are important. A one-unit increase in each revenue variable is associated with a 38% reduction in odds of failure \((1-0.62)\), whereas a one-unit increase in cost is associated with an 11% increase in odds of failure. The development and increase of revenue sources appear more crucial than controlling costs based on this model.

**Successful Districts' Benchmarks.** Table 4 provides the means for participation and financial indicators of districts successful in achieving a break-even or better outcome during the 1997-98 school year. Schools with enrollments of less than 400 were unable to break even or make a profit. About 16% of the districts with enrollments of 401 to 1,800 were successful, and 47% of the districts with enrollments > 1,800 were successful. As enrollments increased, the percentage of schools able to achieve financial success also increased. Lunch and breakfast participation overall and within the free, reduced, and paid categories were lower for larger districts. Larger districts appeared to depend more upon government reimbursement and other sales. Districts with enrollments of 401 to 1,800 depended more upon student payments for reimbursable meals.

Food cost as a percent of revenue was lower for larger districts, but still higher than the 40% recommended by Boehrer (1993). Unsuccessful districts had food costs of 47%. Food costs higher than the national average could be due to Kansas meal programs receiving cash in lieu of commodities. Labor costs for both district sizes were maintained near the recommended level of 40% (Boehrer, 1993). The results of the regression model and the means for successful districts suggested that control of labor costs may be key to achieving financial self-sufficiency.

**CONCLUSIONS AND APPLICATION**

Achievement of financial self-sufficiency will require an intentional change in operations management of school meal programs. Maximization of all types of revenue streams appears crucial to success. The key will be to attract student and faculty customers with high expectations to participate in program offerings. Smith and Shade (1999) reported that 42 of the 48 school districts in Wyoming did not operate self-sufficient programs. They suggested limiting the number of free meals for staff and setting appropriate adult meal prices to promote program self-sufficiency. Students have indicated a desire for quality food, an attractive physical environment, speed of service, and pleasantness of staff (Marples & Spillman, 1995; McConnell, Matta, & Shaw, 1997; Brown, Gilmore, & Dana, 1997).

Table 4. Means for participation and financial indicators of successful meal programs in Kansas schools by district size

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>District Size 401-1800 Mean ± SD (n=6)</th>
<th>District Size &gt;1800 Mean ± SD (n=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lunch</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Paid</td>
<td>63.6 ± 7.4</td>
<td>38.0 ± 12.0</td>
</tr>
<tr>
<td>Reduced</td>
<td>75.7 ± 3.2</td>
<td>60.4 ± 9.4</td>
</tr>
<tr>
<td>Free</td>
<td>76.8 ± 3.3</td>
<td>69.2 ± 6.1</td>
</tr>
<tr>
<td>Breakfast</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Paid</td>
<td>10.3 ± 2.6</td>
<td>3.9 ± 3.8</td>
</tr>
<tr>
<td>Reduced</td>
<td>26.7 ± 4.0</td>
<td>12.7 ± 7.7</td>
</tr>
<tr>
<td>Free</td>
<td>37.9 ± 7.3</td>
<td>26.2 ± 11.5</td>
</tr>
<tr>
<td>Overall</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Lunch</td>
<td>66.1 ± 7.2</td>
<td>49.0 ± 9.5</td>
</tr>
<tr>
<td>Breakfast</td>
<td>16.2 ± 4.1</td>
<td>11.5 ± 7.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financial Indicators</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal/State</td>
<td>38.6 ± 11.5</td>
<td>52.0 ± 19.1</td>
</tr>
<tr>
<td>Student</td>
<td>50.6 ± 14.1</td>
<td>25.9 ± 12.7</td>
</tr>
<tr>
<td>Other</td>
<td>10.1 ± 6.9</td>
<td>20.4 ± 13.7</td>
</tr>
<tr>
<td>District Transfers</td>
<td>0.7 ± 0.8</td>
<td>1.8 ± 1.3</td>
</tr>
<tr>
<td>Expenses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>51.2 ± 9.3</td>
<td>44.0 ± 0.1</td>
</tr>
<tr>
<td>Labor</td>
<td>40.7 ± 1.8</td>
<td>39.4 ± 0.8</td>
</tr>
<tr>
<td>Equipment</td>
<td>1.2 ± 0.0</td>
<td>2.4 ± 0.0</td>
</tr>
<tr>
<td>Contract</td>
<td>0.7 ± 0.0</td>
<td>1.2 ± 0.0</td>
</tr>
<tr>
<td>Other direct</td>
<td>3.2 ± 0.0</td>
<td>3.3 ± 0.1</td>
</tr>
<tr>
<td>Indirect</td>
<td>1.9 ± 0.0</td>
<td>0.9 ± 0.0</td>
</tr>
<tr>
<td>Percent profit without transfer (%)</td>
<td>1.7 ± 1.6</td>
<td>6.1 ± 2.5</td>
</tr>
</tbody>
</table>

*Reported as a percent of total revenue.

Creative marketing of programs should follow quality improvement. Gaining the support of opinion leaders among students and teachers may enhance marketing efforts. Government revenue can be increased by improving the application process for free- and reduced-priced meals and by assuring students of privacy if they receive assistance (Gleason, 1996). Student payments for reimbursable meals can be increased by increasing flexibility in meal choices and by bundling meals similar to those offered by commercial operations.

Control of labor costs also should receive priority. Scheduling labor for highest
Research in Action

productivity on a per-meal basis using workflow analysis or computer modeling has been shown to save labor dollars (Miller, 1991; Tart & Taylor, 1997). Increasing wage and benefit costs may encourage reevaluation of make vs. buy for menu items, if quality can be maintained by purchasing convenience foods, with a simultaneous reevaluation of needed labor.

Meal programs must gain the support of school administrators to formulate and maintain policies that augment financial success. Such issues as meal scheduling, payment collection methods, bus scheduling, and meal pricing may not be issues that are controlled by meal program managers, yet they can seriously affect the financial status of the program. Improved relations with administrative personnel and school boards ultimately may impact the program’s ability to relieve the district of program subsidization.

As they struggle with meeting nutritional and federal government reporting requirements, program managers may have inadequate time or training to address financial management issues. Computerization of meal program functions can save time, improve efficiency, and increase student sales privacy (Boehrer, 1993). The confidence gained in using computer software may enhance state or regional efforts in financial-management training. Continued efforts to standardize reporting procedures would contribute to improved overall program accountability (Conklin & Cater, 1998).

Limitations of Study. This study relied on audited, meal-program, financial reports submitted to the Kansas Department of Education. Districts were not contacted to investigate explanations of outcomes. States with different revenue and expense categories and reporting requirements may have different outcomes. Schools without meal accountability software may have a greater variance of reported vs. actual students served.

Future Research. School meal programs perform a critical role in student learning and physical welfare. With such an important mission, district administrators and managers should seek to achieve programmatic financial self-sufficiency. This research is an important step toward understanding indicators of financial self-sufficiency. Additional state and regional benchmarks can be developed. Financial outcome studies in different states are warranted to ensure that economic differences and state government reporting requirements are included. Use of these significant predictors can enhance research efficiency by directing investigations to operational problems and developing proposed solutions in the most needed areas. A survey of administrators matched to district financial data could provide additional key information to more fully understand policies impacting the financial success of school meal programs.

ACKNOWLEDGEMENTS
This research was funded in part by the Hubert Humphrey grant from the American School Food Service Association and the Joan Coleman Fellowship of the Kansas State University Foundation. This is contribution No. 99-519-J from the Kansas Agricultural Experiment Station.

REFERENCES
Kansas State Department of Education. (1998). Definitions of financial reporting terms for Budget Form USD-E. Topeka, KS.
Kansas State Department of Education. (1997). District enrollment data, Topeka, KS.
Otting, R. (1997, October 24). E-mail communication to author.
Perspectives of Experienced School Foodservice Directors on Central Foodservice Systems

Jeannie Sneed, PhD, RD, SFNS

The changing environment in school foodservice, characterized by the need for cost containment and the limited availability of labor, necessitates school foodservice directors to evaluate their foodservice operation and look for ways to be more efficient and cost effective. Centralizing food production is one option that can be considered, yet that option can be daunting because of the complexity of decisions, the need to garner support from a variety of constituencies, and the limited knowledge many school foodservice directors have about the process. The purpose of this qualitative research study was to identify and discuss issues about central foodservice systems that would influence school foodservice directors’ decisions to adopt this system and assist them in planning a system. Information collected in this study will be used in planning and developing a manual on centralized food production.

Twelve school foodservice directors in districts with central food production were invited to a meeting to discuss issues related to central foodservice systems. Twelve questions developed by the researcher were discussed by these directors, and summarized by the researcher based on the content areas that emerged.

Answers are presented to questions related to the impetus for pursuing a central kitchen, factors considered in planning, resources/sources of information used, role of the director in planning, surprises in planning and implementing, challenges/problems faced in planning and implementing, advice to directors contemplating central food production, challenges/problems faced in operations, changes that directors would recommend, recipe modifications, food safety assurance procedures, and advantages.

The major impetuses for implementing central kitchens included growth, quality control, financial advantages, labor limitations, facility limitations, and increased flexibility. Factors considered in planning related to garnering support, feasibility, district/environment, labor, and operations. Surprises, such as those related to human resources, equipment/systems, and time issues, were identified and will help prepare directors for these issues when they plan a central food production facility. Responses to all of these questions will be useful to school foodservice directors who are considering a central foodservice system in their district, and would help directors know the issues that need to be explored. Knowing the actual advantages of central food production from experienced directors may be useful in justifying and gaining support for a new system. Further, directors may be able to avoid problems when armed with this information.

The school foodservice environment is changing rapidly. There are many trends that are impacting large numbers of school districts. At the 1999 American School Food Service Association (ASFSA) National Leadership Conference, attendees from across the United States identified operational trends/changes that are impacting their operations (Friedland, 1999). One of the areas that is presenting a major challenge relates to labor: labor shortages; the need for more qualified employees; an increase in generational differences in the workforce; an increase in employees whose first language is not English; and a lack of necessary transportation for employees.

In addition to labor challenges, school foodservice directors report increases in costs as a result of new regulations and use of their kitchens for nontraditional operations. They also report that there are increases in cooperative purchasing, geographic distances due to the consolidation of schools, and the number of students eating at school.

Many of these changes/trends impact the way food is produced and served in school, and may necessitate changes in the foodservice system that is used in school districts to meet the demand for school meals. Centralized systems are viable alternatives that are increasing in popularity because of their cost and labor efficiencies. In fact, the 1999 Operations Survey conducted by ASFSA found that nearly 80% of all school districts have onsite kitchens for their foodservice operations. Twenty-three percent of the directors indicated that their district has a central production facility, and 13% have a central bakery. In a study of 274 school foodservice directors who had made a deci-
sion to change systems within the past 10 years, Nettles and Gregoire (2000) found that only about 12% selected cook/chill systems, while 44% selected conventional onsite systems and 44% selected base kitchens.

In making the decision about which foodservice system to adopt, school foodservice directors considered many factors. Compared to school foodservice directors who selected conventional or base kitchens, those who selected central cook/chill foodservice systems were more likely to consider the "projected year-end fund balance, ability to provide food to other schools, additional or new delivery/transportation equipment, break-even point, additional or new production equipment, and satellite school kitchen construction/renovation" (Nettles & Gregoire, 2000). In addition, those who selected cook/chill systems were more likely to consider "equipment manufacturer information, equipment manufacturer technical assistance and training, centralization of production, foodservice consultant advice, pay-back period, operation of an ingredient room, ingredient room construction, operation of a test kitchen, test kitchen construction/renovation, and microbiological testing of prepared foods than were directors who selected onsite or base kitchens" (Nettles & Gregoire, 2000).

There are two studies that examined the impact of a central foodservice system on employee satisfaction and food quality. Green (1997) studied a school district in North Carolina that was changing from a conventional foodservice system to a central cook/chill foodservice system. After implementation of the cook/chill foodservice system, employees reported to be satisfied with their jobs and with the quality of the food that they prepared. Green pointed out that the success of the change in systems was, in part, due to the steps that the foodservice director made to "assure that employee needs with regard to job variety, ability to make decisions, and be informed were considered, along with the need to improve productivity and profitability" (1997).

Kim and Shanklin (1999a; 1999b) studied a Midwestern school district that was changing from a conventional to a central cook/chill foodservice system. They evaluated students' acceptability ratings for spaghetti with meat sauce, both before and after the system change (1999a). Two cohorts of students were used: one cohort preferred the entree when prepared with the conventional system, and one cohort preferred the entree prepared using the central cook/chill system. Plate waste was less for the central cook/chill system.

The researchers also examined the impact of the change on employees' attitudes and job satisfaction (1999b). Data were collected from employees prior to the change, five months following the change, and 1.5 years after the system change. They found that after an adjustment period, employees had a higher level of job satisfaction than before the change. All measures of attitudes were more negative after five months, and then became more positive after 1.5 years compared to attitudes prior to the change. These researchers concluded that management must be aware of the human impact of a change in system.

Several research studies have focused on various aspects of cook/chill and cook/freeze foodservice systems in hospitals, including selection decisions for a foodservice system (Greathouse & Gregoire, 1988; Nettles & Gregoire, 1997), satisfaction (Nettles & Gregoire, 1996), and financial performance (Greathouse, Gregoire, Spears, Richards, & Nassar, 1989). There is a paucity of research related to planning and operational issues in central foodservice systems in schools. The purpose of this study was to identify and discuss issues about central foodservice systems that would influence a school foodservice director's decision to adopt a system and to assist in planning and operating such a system.

**Table 1. Factors school foodservice directors considered in planning a central kitchen**

<table>
<thead>
<tr>
<th>Support for the Proposed System</th>
<th>Labor Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Funding</td>
<td>• Labor supply</td>
</tr>
<tr>
<td>• District bond issue needed</td>
<td>• Labor unions</td>
</tr>
<tr>
<td>• School board</td>
<td>• Impact on labor</td>
</tr>
<tr>
<td>• School administrators</td>
<td>• Job security concerns</td>
</tr>
<tr>
<td>• Community</td>
<td>• Training concerns</td>
</tr>
<tr>
<td><strong>Feasibility</strong></td>
<td>• Health/HACCP/safety — back and shoulder injuries, decrease in accidents</td>
</tr>
<tr>
<td>• Customer expectations</td>
<td>• Physical wear and tear on employees</td>
</tr>
<tr>
<td>• Feasibility study/business plan</td>
<td>• Specialization</td>
</tr>
<tr>
<td>• Consultant recommendations</td>
<td></td>
</tr>
</tbody>
</table>

**District/Environment**

- Location/land availability
- Size of district
- Growing or declining student numbers
- Geography of the district — distance, traffic, accessibility
- Future trends
- Central kitchen impact on the community — added truck traffic (trucks, deliveries, etc.)
- Political — central services needed by district, zoning issues
- Type of production
- Menu
- Preplate vs. bulk
- Cook chill vs. hot food delivery
- Transportation
- Differences in production, warehouse, drivers, etc.
- Equipment requirements/specifications
- Existing equipment

**METHODOLOGY**

The National Food Service Management Institute (NFSMI) held a meeting in Spring 2000 to determine the content of the manual that it is developing on central food production for school foodservice. A convenience sample, consisting of 12 school foodservice directors, was invited to attend. These directors were selected based on geographic representation (Arizona, Kansas, Kentucky, North Dakota, Nevada, Massachusetts, Minnesota, Oregon, Pennsylvania, Oregon, Utah, and Washington), size of school district (ranging from a low of 3,500 to a high of 20,000), and experience with
Table 2. Surprises school foodservice directors found in planning and implementing a central kitchen and their advice to directors contemplating a central kitchen

<table>
<thead>
<tr>
<th>BIGGEST SURPRISES IN PLANNING AND IMPLEMENTING A CENTRAL KITCHEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Resource Issues</td>
</tr>
<tr>
<td>• Staff did not want to transfer to the central kitchen</td>
</tr>
<tr>
<td>• Lack of understanding from human resources department about the following issues:</td>
</tr>
<tr>
<td>✓ Job descriptions</td>
</tr>
<tr>
<td>✓ Salary requirements for new job descriptions</td>
</tr>
<tr>
<td>✓ Recruitment of qualified staff</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment/System Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Getting the “bugs” out of the equipment so that it runs smoothly</td>
</tr>
<tr>
<td>• Equipment is difficult to repair, and repair is difficult to get because of the specialized nature of the equipment</td>
</tr>
<tr>
<td>• Impact of equipment breakdowns</td>
</tr>
<tr>
<td>• Lack of expertise with equipment vendors and repair</td>
</tr>
<tr>
<td>• Plumbing, ventilation, mechanical structural challenges with the facility</td>
</tr>
<tr>
<td>• HVAC and maintenance staff are afraid of the system/equipment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Time and details involved in planning</td>
</tr>
<tr>
<td>• Time involved in preparing managers</td>
</tr>
<tr>
<td>• Time and volume to stock the warehouse/freezers/refrigerators</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ADVICE FOR SOMEONE CONTEMPLATING A CENTRAL KITCHEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decisionmaking</td>
</tr>
<tr>
<td>• Develop a global vision of your foodservice system</td>
</tr>
<tr>
<td>• Recognize perceptions that people may have about mass-produced food, for example:</td>
</tr>
<tr>
<td>✓ Food that is mass-produced will have a “plastic” appearance</td>
</tr>
<tr>
<td>✓ Preplate = mass produced</td>
</tr>
<tr>
<td>✓ Disposables are bad for environment</td>
</tr>
<tr>
<td>• Do extensive research about the alternatives that are available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Visit school foodservice operations that have central kitchens; be sure to include travel in the budget</td>
</tr>
<tr>
<td>• Ask a lot of questions of directors who operate central kitchens</td>
</tr>
<tr>
<td>• Determine what computer systems are available</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Involve lots of people in planning facilities: security, negotiating, Department of Education, human resources, PTA, safety office, health department, community, school board, USDA</td>
</tr>
<tr>
<td>• Interview consultants</td>
</tr>
<tr>
<td>• Hire a good consultant early in the planning process</td>
</tr>
<tr>
<td>• Get your school board’s support</td>
</tr>
<tr>
<td>• Involve the health department</td>
</tr>
<tr>
<td>• Consider proximity of foodservice with school administration and shared overhead costs</td>
</tr>
<tr>
<td>• Conduct a feasibility study</td>
</tr>
<tr>
<td>• Develop facility and operation together (workflow, vision)</td>
</tr>
<tr>
<td>• Pay attention to the little things: outlets, plumbing, slopes, get help with details</td>
</tr>
<tr>
<td>• Build the facility to be flexible to change</td>
</tr>
<tr>
<td>• Order three times the carts and transportation equipment you think you need</td>
</tr>
<tr>
<td>• Plan HACCP from the beginning</td>
</tr>
<tr>
<td>• Trust advice of staff (before consultants)</td>
</tr>
<tr>
<td>• Be a part of the selection of the architect</td>
</tr>
<tr>
<td>• Review actual plans and provide feedback/input</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hire experienced contractors</td>
</tr>
<tr>
<td>• Be constantly and consistently involved in the daily building project</td>
</tr>
<tr>
<td>• Expect delays</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Plan to phase-in operation</td>
</tr>
<tr>
<td>• Develop monitoring crew for satellite level</td>
</tr>
<tr>
<td>• Have a contingency plan to cover weather, foodborne illness, power outages, driving/delivery conditions</td>
</tr>
</tbody>
</table>

central food production (ranging from operating a central kitchen for less than 1 year to more than 20 years). The directors represented various types of central food production systems, including central kitchens using cook/chill, hot-bulk distribution, and pre-plate. One director purchased food from an adjoining school district that operated a central cook/chill operation.

The researcher developed 12 questions designed to explore issues related to planning and implementing a central foodservice system. The questions were:

- What was the impetus for pursuing a central kitchen in your school district?
- What factors did you consider when planning a central kitchen?
- What resources/sources of information did you use in planning your central kitchen?
- What was your role in planning the central kitchen?
- What was your biggest surprise in planning and implementing a central kitchen?
- What challenges/problems did you face in planning and implementing a central kitchen?
- What advice would you give someone who is contemplating a central kitchen?
groups, provided with the list of questions, and asked to answer each question. Each group discussed all questions, recorded their responses on newsprint paper, and posted the responses on the wall. All three groups shared their answers with the entire group and an additional discussion took place. This procedure was used to ensure that the breadth of the responses was captured for each question. There was no intent to place a level of importance on the answers, since results were intended primarily to support the development of the manual.

The responses to all of the questions have been summarized. In some cases, the researcher placed the responses into categories when natural groupings were apparent.

RESULTS AND DISCUSSION

Question 1: Impetus for pursuing a central kitchen in school district? Growth in the school district and financial issues were two major reasons given for implementing a central kitchen. Related to finances, the high cost of labor, limited money to build and equip new onsite kitchens, reduced space availability in schools, lower utility costs, and improved purchasing efficiencies contributed to the decision. In addition, quality/consistency of products (including the increased control over food safety), facility limitations, the declining skill base and availability of labor, and flexibility were noted as reasons to pursue a central kitchen. One director noted that he was able to sell the idea because it provided a resource for disasters such as floods or earthquakes.

Question 2. Factors considered when planning a central kitchen? The factors considered related to five major areas: Support for the proposed system, feasibility, district/environment, labor considerations, and operations (Table 1). Directors also noted that they considered themselves as a factor in planning the central kitchen—particularly the time and expertise required to plan and implement the system. Directors indicated that there was a significant amount of risk for their jobs due to the cost and complexity of the project.

Question 3. Resources/sources of information used in planning central kitchens? These school foodservice directors suggested several resources and sources of information that would be useful in planning a central foodservice system. Some of the important sources are other school districts that have central kitchens. This includes discussions with school foodservice directors in those districts, as well as site visits to see the central food production facilities in action. Vendors (equipment manufacturers' representatives), consultants, and architects are good sources of information. The school district facilities staff and representatives of the health department are other good sources of information. School foodservice directors also can draw on their own experiences in planning a new central kitchen. In addition, directors can refer to books, manuals, magazines, and the Internet for information.

Nettles and Gregoire (2000) found similar sources of information useful to a national sample of school foodservice directors who had selected a new foodservice system (not just central facilities). They reported that directors used the following resources, in descending order: discussions with users of the system being considered; visits to other facilities; seminars and conferences; equipment manufacturers; industry journals; foodservice consultants; manufacturers' representatives; and professional journals.

Question 4. Role of school foodservice director in planning central kitchen? Several roles were identified for the school foodservice director in planning the central kitchen. First, the director needs to be a visionary. Second, the director serves as the project manager with primary responsibility for the project. The role of project manager necessitates that the director drives the process, is perseverant and highly committed, and has constant and consistent involvement in the entire process. Some directors noted that this role caused them to have the biggest workload in 20 years of foodservice experience.

A third role is that of liaison with foodservice staff, PTA, school administration, school board, faculty, and the community. The director tries to get "buy-ins" from these various stakeholders. Related to the liaison role is that of educator. The foodservice director must educate stakeholders about the new system as a part of encouraging "buy-in."

Question 5. Biggest surprise in planning and implementing a central kitchen? The biggest surprises could be categorized into issues related to human resources, equipment/systems, and time (Table 2). Other surprises included the huge learning curve and the perceptions of other school foodservice directors. It was also surprising to directors that there was not an availability of relevant software to support central kitchen operations, financial reporting mechanisms (such as state reporting forms), and standardized recipes for very large quantities.

Question 6. Challenges/problems faced in planning and implementing a central kitchen? There were several challenges faced by school foodservice directors in planning and implementing a central kitchen. First, many faced difficulty in selling the idea to the school board, community, city council, and foodservice staff. Second, determining the best type of system was a challenge. Third, funding often was a challenge—some funded the project themselves, while others had to rely on bond issues. Fourth, there was a lack of current information on central kitchens and their use in schools. A fifth challenge was determining an appropriate location for the central kitchen, keeping in mind transportation into and out of the facility. The sixth challenge noted was the training of employees and dealing with their fear of change.

Question 7. Advice for someone who is contemplating a central kitchen? Advice given by these school foodservice directors was related to four areas: decisionmaking, planning, construction, and implementation (Table 2). Throughout the entire process, they stressed the importance of involving staff in planning and communicating to staff.

Question 8. Challenges/problems faced in operating a central kitchen? The challenges/problems generated could be sorted into five categories: customer, planning for the future, employee/labor, equipment/facilities, and operations (Table 3). Understanding these challenges will help a school foodservice director be proactive to avoid these problems in their own operations.

Question 9. Changes directors would make in their central kitchen/satellite operation? Changes that directors would make in their existing central kitchen operations—if they could do them over—relate to the building layout and design, equipment, and personnel (Table 3). These suggested changes give direction to directors planning a new facility. They also suggested
that there's a need for an established network of central kitchen operators nationwide.

**Question 10. Recipe modifications necessary for central production?** Directors indicated that several modifications in recipes and food items were required. The types of menu items may need to be modified because of transporting and holding conditions. Ingredient changes for central food production have been required in their operations. Some of the changes include the use of coarser ground beef, careful use of such ingredients as vinegar, higher gluten flour, modified starches for thickening, and pastas made from harder wheat. They also noted that tomato paste cannot be used with some of the automated can openers.

The cooking procedures also must be modified. The weight of ingredients will be critical when cooking in large quantities. Thus, ingredients will need to be weighed. When modifying recipes for central production, the procedures may need to be changed and reheatalization will need to be considered in determining cooking times and directions. Equipment use and scheduling of production also may need to be modified.

The system used also has implications for menu and recipe choices. Preplated systems require foods that fit into specified containers, have a consistency appropriate for automated fillers or be individually quick frozen (IQF) in the correct weight, and can be prerapped. For cook/chill operations, food items must be pupmable. Some products, such as pasta, are difficult to cook and will require changes in cooking times and methods.

**Question 11. Procedures/processes to ensure food safety?** Procedures used to ensure food safety relate to operational processes, equipment, and personnel. Related to operational processes, many central kitchens have implemented HACCP plans that include time/temperature and product flow logs, and they also are using antibacterial cleaning products for cleaning. Related to equipment, central kitchen operations use blast or tumble chillers for quick chilling in cook/chill operations, transport food in refrigerated trucks, and have temperature-recording devices on refrigerators and freezers. Some directors indicated that they have independent laboratory testing of food and equipment to ensure safety. Personnel procedures include: hiring ServSafe certified managers and lead cooks; stressing that handwashing should be a priority; training all employees and providing a written training manual and procedures related to food handling. Many central kitchens have one person in charge of a HACCP program.

The foodservice directors indicated that employee safety and working conditions are an important consideration. Work in a central kitchen is physically demanding, and the work often requires repetitive motion and lots of twisting and turning. The repetitive nature of the work also creates boredom. Including planned stretch breaks is one practice used to lessen the negative physical impacts. Directors identified measures that they take to ensure employee safety, including use of a safety consultant, safety committee, safety teams, and having a written safety manual. Purchasing safe equipment and training employees on the safe operation of equipment are additional strategies used.

**Question 12. Advantages of a central kitchen?** Directors identified many advantages of central kitchens in their school districts (Table 4). These advantages were related to four general areas: menu planning, purchasing/inventory control, labor efficiencies/cost control, and quality control. In an onsite foodservice system with many schools, there is variation in the quality and consistency of the food based on the training of employees, use of standardized recipes, size of portions served, and depending on how purchasing takes place, the quality of food purchased. Centralizing food production controls for many of these variables can impact quality and consistency. Because of the scope of the system, there often is an individual hired whose major responsibility is quality control and assur-

---

**Table 4. School foodservice directors' perceptions of the advantages of a central kitchen in their school districts**

<table>
<thead>
<tr>
<th>Menu Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>- One menu is planned throughout the district, thus, there is need for only one nutritional analysis and menu costing</td>
</tr>
<tr>
<td>- Less time is required for menu planning activities</td>
</tr>
<tr>
<td>- Nutrient Standard Menu Planning can be implemented more easily due to having only one menu</td>
</tr>
<tr>
<td>- The menu can be planned to stay within the budget, and there will be consistency across all schools within a district</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labor Efficiencies/Cost Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>- The total labor costs for an operation will be decreased.</td>
</tr>
<tr>
<td>- Staff skills and specialization can be developed.</td>
</tr>
<tr>
<td>- There is an increased opportunity for the use of full-time staff in the central foodservice operation, which provides stability to the operation.</td>
</tr>
<tr>
<td>- Overtime can be eliminated.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quality Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Improved quality and consistency occurs when all production occurs at one site.</td>
</tr>
<tr>
<td>- Food safety risks can be reduced with central foodservice systems.</td>
</tr>
</tbody>
</table>
The person can develop appropriate HACCP systems for the central kitchen, can train employees about safe food handling and how to implement the HACCP system, and can monitor food quality. This oversight often would not be possible in a decentralized (onsite) system.

CONCLUSIONS AND APPLICATION
The questions presented in this paper are those that many school foodservice directors would ask if they were considering any form of centralized food production. The wisdom of school foodservice directors who have gone through the decision process, who have planned and implemented a central foodservice system, and currently are running them could be very useful to a foodservice director contemplating centralization. The advantages identified by directors would provide justification for implementing a system, and would be useful in garnering support from school administrators, school board members, and the community. The impetus for pursuing a central kitchen can be compared with the actual advantages identified by directors to help determine if a central kitchen would be useful in a specific school district.

The role of the school foodservice director in the planning process has been identified, and would help a director be realistic about the scope of the project and the time commitment required. Identification of resources can assist directors in their search process. Responses related to surprises, challenges/problems, and advice can help school foodservice directors avoid problems in their planning and implementation processes. This might help save both time and money and make the process run more smoothly.

Results of this qualitative research also can be valuable for foodservice consultants working with school districts. These results can serve as the basis for future research on operational issues related to central foodservice systems in schools, which would be very useful since there has been little published research with this focus.

ACKNOWLEDGEMENTS
This publication was supported by a grant from the USDA through NFSMI. Its contents are solely the responsibility of the author and do not necessarily represent the official views of the USDA or NFSMI. Special appreciation is extended to the participants of the meeting: Cathy Brown, Peter Fatalino, Robert L. Horson, Carol Johnson, Gale Ladwig, Sandy Moore, John Moriarty, David Rice, Jean Ronnel, Cynthia Barnes-Ross, Cheryl Sturgeon, and Bob Ward. The contributions of Jane Logan, executive director of NFSMI, also are appreciated.

REFERENCES
The purpose of this study was to analyze the types and amounts of the waste generated in a food-processing center and three satellite schools (an elementary, a middle, and a high school), and to identify the amount of waste that could be composted or recycled. A waste stream analysis was conducted during five consecutive days in a metropolitan school district. Waste at the food-processing center was sorted into food, five types of packaging, and mixed waste. Service waste collected at three schools was sorted into food, liquid, and packaging. The weight of the residues was measured and the volume of the waste was calculated using conversion factors.

A total of 135,982 meals were prepared in the food-processing center during the five days. A total of 7,691 pounds (3.8 tons) or 51 cubic yards of production waste was generated. The food-processing center generated 0.06 pound or 0.07 gallon of waste per meal. Cardboard boxes and food waste composed 41% and 35% of the production waste by weight, respectively. Cardboard boxes, Styrofoam, and food waste constituted 62%, 11%, and 11% of the total volume, respectively. The food-processing center could divert 65 tons or 237 cubic yards of food waste from landfills during the school year that could be used as feedstock for composting. Implementation of a cardboard recycling program could reduce the volume of the waste transported to landfills by more than 60%.

During the study, the elementary schools served 1,836 meals, the middle school served 3,113 meals, and the high school served 2,333 meals. A total of 2,728 pounds (1.4 tons) or 8,686 gallons (33.5 cubic yards) of service waste was generated at the three schools. An average of 0.37 pound or 0.37 gallon of waste was generated per meal. Elementary students (0.56 pound/meal or 0.55 gallon/meal) discarded more waste than the middle (0.32 pound/meal or 0.30 gallon/meal) and high school students (0.28 pound/meal or 0.23 gallon/meal).

Food and packaging wastes were the major components of the total service waste by weight and volume, respectively. These schools could divert more than 50% by weight and 20% by volume of the total waste from landfills for composting.

Having food waste collected by a local composting operation and implementing a cardboard recycling program will result in significant cost savings for the school district. These waste-management practices also are more environmentally friendly than transporting the materials to landfills.

The National School Lunch Program is the largest foodservice program in the United States. The U.S. Department of Agriculture (USDA) (2000) reported that a total of 4,509.9 million meals were served in the 1999 school year. The production and service of these meals generate a significant amount of waste. Many researchers and stakeholders of school foodservice have emphasized the importance of waste management (Behan, 1994; Hackes & Shanklin, 1999; Hollingsworth, Shanklin, & Cross, 1995; Mann, Shanklin, & Cross, 1993; Shanklin, 1991; White, Sneed, & Martin, 1992).

Enhanced interests in protecting the environment and sustaining natural resources have increased the focus on the most effective ways to discard waste. Landfilling, the third alternative on the U.S. Environmental Protection Agency (EPA) hierarchy (1989), still is the most common method of disposing of waste in the United States (Glenn, 1999). However, the reliance on landfills decreased from 85% in 1989 to 61% in 1999. The rate of recycling, including composting, increased four times to 31.5% during the same period. As landfills have reached their capacity and waste disposal costs have increased, foodservice directors have been forced to reduce the amount of waste generated from their facilities and to evaluate alternative waste-disposal methods (Shanklin, 1991; Su, Mason, & Shanklin, 1997).

Previous studies have identified the types and amounts of waste generated in school foodservice (Hollingsworth et al., 1995; Hollingsworth, Shanklin, Gench, & Hinson, 1992; Shanklin, 1991; White, Sneed, & Martin, 1992).
Table 1. Number of meals served at a food-processing center and three schools

<table>
<thead>
<tr>
<th>Location</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Total</th>
<th>Daily Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing Center Schools</td>
<td>27,959</td>
<td>28,168</td>
<td>25,360</td>
<td>29,064</td>
<td>25,521</td>
<td>135,992</td>
<td>27,198.4</td>
</tr>
<tr>
<td>Elementary</td>
<td>381</td>
<td>380</td>
<td>388</td>
<td>398</td>
<td>389</td>
<td>1,936</td>
<td>387.2</td>
</tr>
<tr>
<td>Middle</td>
<td>508</td>
<td>623</td>
<td>582</td>
<td>659</td>
<td>741</td>
<td>3,113</td>
<td>622.6</td>
</tr>
<tr>
<td>High</td>
<td>481</td>
<td>458</td>
<td>437</td>
<td>416</td>
<td>481</td>
<td>2,333</td>
<td>466.6</td>
</tr>
</tbody>
</table>

*Includes meal equivalent for a la carte sales

*Includes the number of meals served at breakfast

Kim, 1998). In school foodservice programs with a conventional production system, cardboard boxes and food wastes composed the largest percentage of waste by weight in production areas, whereas cardboard boxes and paper constituted the largest percentage by volume. Food waste and milk cartons were the major components of service waste.

The composition and amount of waste are influenced by such factors as the types of production and services systems, the type of serviceware used, the market forms of the foods, and the menu items served (Ferris, 1995; Ghiselli, Hiemstra, & Almanza, 1995; Hollingsworth et al., 1992). The conventional system generates more food waste and less packaging waste compared to other production systems (Ferris, 1995; Kim, 1998). Kim (1998) reported that the composition of production waste was changed after a central kitchen converted its production system from conventional to a cook/chill system.

Volume reduction was the most common practice used to decrease waste and the associated disposal expenses (Mann et al., 1993; Su et al., 1997). The number of school foodservice facilities that participated in recycling has increased in recent years (American School Food Service Association, 1999; Hackes & Shanklin, 1999). Cardboard boxes, office paper, tin cans, and aluminum were recycled most frequently, and the least recycled materials were Styrofoam and food waste.

Changes have been reported in the number of school foodservice programs responsible for waste disposal costs. Less than 20% of school foodservice operations surveyed in 1993 paid a waste hauling fee as a budget item of the foodservice department (Mann et al., 1993). Hackes and Shanklin (1999) reported that 41.5% of the school foodservice directors surveyed were charged directly for waste removal. With the decrease in state funding for public schools, school districts are shifting costs to departments that use specific services. As this trend continues, more foodservice directors will be expected to pay all the indirect costs of producing and serving meals, including waste-disposal costs.

School foodservice directors need to implement economical and environmentally safe waste-management plans. In order to design waste-management programs, they must understand not only the composition and amount of the waste generated at their facilities but also alternative waste disposal methods.

Most of the studies to date—except Kim's study (1998)—have been conducted in onsite foodservice operations using the conventional system. The purpose of this study was to identify the types and amounts of waste generated at a food-processing center using the conventional system and at satellite schools, and to quantify the amounts of residues that could be recycled or composted.

**METHODOLOGY**

A waste stream analysis was conducted during five consecutive days in May 1999 at a central food-processing facility and three satellite schools (an elementary, a middle, and a high school) in a metropolitan school district. The food-processing center used a conventional production system to prepare food for 95 public schools, 5 private schools, and the catering services in the district. Hot foods were prepared on the day of service and held in holding carts prior to and during transporting to the satellite schools, which did not have steamtables. No onsite preparation occurred at the elementary school. The middle and high schools had limited production equipment, and hot a la carte items and French fries were prepared onsite.

A set menu was served to elementary students, with no available a la carte option. Middle school students could choose between two entrees and could purchase a la carte items. High school students could select from five entree choices, a salad bar, and a la carte items from a hot food line and a snack line. A commercial brand of pizza was delivered two days and three days per week to the middle and high schools, respectively. Disposable utensils and trays were used in all schools.

Preliminary observations were made to determine the waste categories for the production and service areas. Waste from the food-processing center was sorted into the following categories: food, cardboard, paper/paperboard, plastics, tin/metal, Styrofoam, and mixed wastes. Service waste discarded at lunch was collected at the elementary and middle schools. Because of the waste collection system, service waste at the high school included food and packaging wastes from both breakfast and lunch. Service waste at the satellite schools was sorted into food, liquid, and packaging. Napkins were sorted as packaging waste in the elementary school, but were included in the food waste in the other two schools. An electronic digital scale (OHMUS DS10) was used to weigh the materials. The volume of the waste was calculated using conversion factors (EPA, 1997; R. Gogan, E-mail communication, December 12, 1997; Tchobanoglous, Theisen, & Virgil, 1993).

The number of meals prepared in the food-processing center and the number of meals served at the satellite schools were obtained daily from the food production manager and unit managers, respectively.
A la carte sales at the middle and high school were converted to meal equivalents using the following formula:

\[
\text{Meal equivalents} = \frac{\text{Sales (dollars)}}{\text{Cost of adult meal (dollars)}}
\]

Descriptive statistics were used to determine the average weight and volume of waste and composition of waste based on weight and volume. Waste per meal was computed for each school and the food-processing center.

**RESULTS AND DISCUSSION**

During the five-day study, the food-processing center produced a total of 135,992 meals, an average of 27,199 meals per day (Table 1). The elementary school served a total of 1,936 meals, a daily average of 388 meals. Including the la carte sales, the middle school and high school served averages of 623 and 467 meals daily, respectively.

As illustrated in Table 2, a total of 7,691 pounds or 51 cubic yards of waste was generated at the food-processing center. By weight, cardboard boxes (41%) and food (35%) were the major wastes at the processing center. Cardboard boxes, Styrofoam, and food constituted 82%, 11%, and 11% of the total waste by volume, respectively.

Kim (1998) conducted a waste characterization study at a central kitchen before and after it implemented a cook/chill system. Food waste and cardboard boxes composed 54% and 29% by weight and 9% and 57% by volume, respectively, of total waste with the conventional production system. After implementation of the cook/chill system, the amounts of food waste and cardboard boxes were 24% and 35% by weight and 4% and 57% by volume of total waste, respectively.

In this study, the percentage of cardboard boxes was higher than in previous studies conducted at onsite school foodservice facilities. Hollingsworth et al. (1992) reported that food waste and cardboard constituted 31% and 26% by weight and 4% and 54% by volume of the total production waste, respectively. In another study, conducted at seven schools with onsite production, Hollingsworth et al. (1995) found that food waste and cardboard boxes composed 51% and 23% by weight, respectively. By volume, cardboard boxes constituted 57% of production waste, followed by paper (14%), metal (11%), and food waste (9.2%).

The market form of food used and the return of disposable serviceware from satellite schools can explain the differences in composition of the waste stream in this study. The food-processing center used predominantly convenience products. The majority of food waste from the center was food returned from satellite schools or food discarded from inventory with expired dates rather than preparation waste, such as vegetable and fruit peelings. Some schools returned used Styrofoam serviceware to the processing center for disposal, thus increasing quantity of packaging waste generated at the center. Approximately 10% of waste by volume was soiled disposable serviceware returned from satellite schools.

The results of this study show that most of the waste at the processing center was composed of items that could be recycled or composted. Food waste that composed 35% of total waste by weight could be composted. Cardboard boxes and tin/metal cans, which constituted approximately 50% by weight and 70% by volume of the waste, were the materials that could be recycled, based on available markets.

Per meal, the food-processing center generated 0.06 pound or 0.07 gallon of waste. When compared to other school foodservice programs, the food-processing center generated less production waste per meal. Hollingsworth et al. (1992, 1995) reported that an average of 0.14 to 0.16 pound or 0.29 gallon of production waste was generated per meal at schools with onsite production systems.

Table 3 illustrates the weight and volume of total waste generated at the three satellite schools. A total of 2,728 pounds (1.4 tons) or 2,666 gallons (13.5 cubic yards) of waste was discarded at the three schools during the study. The elementary school generated a total of 1,073 pounds or 1,071 gallons of waste. The middle school and the high school discarded totals of 993 pounds or 931 gallons and 662 pounds or 696 gallons, respectively.

Food waste composed 54% and 22% of total waste by weight and volume, respectively. Liquid waste constituted 15% and 2% of total waste by weight and volume, respectively. The proportion of liquid waste was higher at the elementary school than the other two schools because the elementary students were required to take a carton of milk. Hollingsworth et al. (1992) reported that plate waste composed 65% and 41% of total service waste by weight and volume, respectively, when milk was served in gable-top cartons. Another study by Hollingsworth et al. (1995) found that plate waste constituted 65% and 30% of service waste by weight and volume, respectively, when milk was served in gable-top cartons.

The packaging waste consisted of milk cartons, plastic and aluminum beverage containers, disposable serviceware, napkins, and miscellaneous items. The packaging waste accounted for 32% and 76% of total waste by weight and volume, respectively. Use of disposable serviceware influenced the composition of the service waste. The percentage of packaging by volume was higher than that reported in other studies (Hollingsworth et al., 1992, 1995).

More than 50% by weight and 20% by volume of the service waste were organic materials, including foods, liquid, napkins, and milk cartons that could be composted. Disposable serviceware that was used at all three schools could be recycled. In this
study, an average of 0.37 pound or 0.37 gallon of service waste was generated per meal. The amount of service waste per meal varied based on grade level (Table 4). Elementary students generated more waste than middle and high school students. The elementary students generated 0.56 pound/meal or 0.55 gallon/meal compared to 0.32 pound/meal or 0.30 gallon/meal discarded by the middle school students and 0.28 pound/meal or 0.30 gallon/meal generated by the high school students.

The weight of service waste per meal at the three schools was similar to that reported in other studies. However, the volume of the waste per meal was greater in this study. Hollingsworth et al. (1992) reported 0.34 pound or 0.25 gallon of service waste per meal. In another study conducted at seven schools (Hollingsworth et al., 1995), each student discarded 0.43 pound or 0.25 gallon of service waste. The use of disposable serviceware increased the volume of waste per participant. When the waste per meal in the central processing center was combined with the service waste, however, less waste was generated per participant in this school district than in previous studies (Hollingsworth et al., 1992, 1995). Centralizing food production appeared to decrease the total waste generated per meal.

**CONCLUSIONS AND APPLICATION**

This study analyzed the composition and amount of waste generated at a food-processing center using the conventional food production system and at three satellite schools and identified the amounts of materials that would be available for composting or recycling. During the five-day study, the food-processing center discarded a total of 7,691 pounds or 51 cubic yards of waste. An average of 0.06 pound or 0.07 gallon waste was generated per meal. More than 35% by weight and 11% by volume of total waste were organic materials that could be composted.

Based on the number of meals prepared at the food-processing center during the school year (6,160,000 meals), a total of 369,600 pounds (184.8 tons) or 431,200 gallons (2,156 cubic yards) of solid waste would be generated. At least 129,380 pounds (64.7 tons) or 47,432 gallons (237 cubic yards) of waste could be diverted from landfills for composting in the school year. If the processing center had participated in cardboard and tin/metal recycling programs, the dumpster capacity could have been reduced by 70% or 1,516 cubic yards in the school year.

The three schools generated 2,728 pounds (1.4 tons) or 2,696 gallons (13.5 cubic yards) during the study. Based on these data, these schools would discard 49 tons or 485 cubic yards of solid waste during the school year. Approximately 55% by weight and 22% by volume of the service waste was food, which could be diverted from landfills and composted. If other organic materials, such as milk cartons, were included, the amount that could be diverted from landfills for composting would be greater. If disposable serviceware were recycled, the size of dumpsters could be reduced significantly.

Recent studies have shown an increasing trend of charging disposal costs directly to the departments generating waste (Hackes & Shanklin, 1999; Mann et al., 1993). School foodservice programs produce a significant amount of waste. This study and previous studies found that high percentages of waste from school foodservice were recyclable items, such as cardboard boxes, paper, tin cans, and disposable

---

**Table 3. Total weight and volume of waste generated at three schools during a 5-day period**

<table>
<thead>
<tr>
<th>Waste Category</th>
<th>Weight (Pounds)</th>
<th>Volume (Gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elementary School</td>
<td>Middle School</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>%</td>
</tr>
<tr>
<td>Food</td>
<td>557.40</td>
<td>51.9</td>
</tr>
<tr>
<td>Liquid</td>
<td>205.60</td>
<td>19.2</td>
</tr>
<tr>
<td>Packaging</td>
<td>310.15</td>
<td>28.9</td>
</tr>
<tr>
<td>Total</td>
<td>1,073.15</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>229.38</td>
<td>21.4</td>
</tr>
<tr>
<td></td>
<td>25.70</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>815.89</td>
<td>76.2</td>
</tr>
</tbody>
</table>

---

**Table 4. Comparison of waste generated per meal at three schools during a 5-day period**

<table>
<thead>
<tr>
<th>Waste Category</th>
<th>Weight (Pounds)</th>
<th>Volume (Gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elementary School</td>
<td>Middle School</td>
</tr>
<tr>
<td>Food</td>
<td>0.299</td>
<td>0.195</td>
</tr>
<tr>
<td>Liquid</td>
<td>0.106</td>
<td>0.032</td>
</tr>
<tr>
<td>Packaging</td>
<td>0.160</td>
<td>0.097</td>
</tr>
<tr>
<td>Total</td>
<td>0.555</td>
<td>0.324</td>
</tr>
</tbody>
</table>

*Food waste at the middle and high schools included napkins*
serveware, or items that could be composted, such as food waste, napkins, and milk cartons. Diversion of waste to composting or recycling will reduce the size of dumpster required and the frequency of pickups of materials transported to landfills.

Composting not only is an environmentally conscious choice, but also is beneficial in terms of high quality end products and costs (Rahmani, Hodges, & Kiker, 1999). In the community where the study was conducted, the cost of recycling and composting was lower than that of hauling waste to a landfill—by 70% per ton. Foodservice directors should investigate the feasibility of implementing composting and recycling programs in their facilities. These programs would necessitate purchase or lease of special containers to collect organic waste, or recycling materials. Northeastern and northwestern states have reported a higher proportion of food residue composting than the other regions (Glenn, 1999). Foodservice directors who are interested in off-site composting can obtain information about commercial composting sites accepting food waste from the state agency that monitors environment.

When investigating the various disposal options, the waste-disposal methods should be matched with the availability of recycling or composting facilities, regulations, storage space, utility cost, and labor. These factors should be evaluated in determining the most cost-effective and environmentally friendly waste-management options. Foodservice directors should conduct waste stream analysis to determine the composition and amount of waste generated, so they will have specific data to analyze the feasibility of each waste-management alternative.

School foodservice directors also should consider other strategies to reduce the quantity of waste generated. Purchasing materials with less packaging, better forecasting, and food donation can help reduce production waste. At the time of the study, the food-processing center participated in a food recovery program. Waste from service areas also can be reduced by implementing an environmental education program in conjunction with nutrition education, enhancing meal acceptability, providing choices, changing serving methods, and controlling portion size. The offer vs. serve option has been reported to reduce the amount of plate waste (Dillon & Lane, 1989; Ribichaus & Adams, 1985). The district should assess the possibility of instituting this option in elementary schools.

School foodservice directors were reported to perceive cost factors as more important than environmental factors (Hackes & Shanklin, 1999). Future studies should analyze and compare costs of various waste disposal methods and operational variables that influence the implementation of each alternative.

ACKNOWLEDGEMENTS
The authors gratefully acknowledge the efforts of the foodservice director in the school district where the study was conducted. Appreciation is expressed to Young Suk Choi, Adol Chyuon, Soo-Kyoung Kang, and Kara Wolfe for their assistance with data collection. This is contribution number 00-337-J from the Kansas Agricultural Experiment Station.

REFERENCES
Summary of Research

The FNS Research Corner provides a continuing series of summaries of recently completed and current research conducted by the Food and Nutrition Service (FNS) in the area of child nutrition. For further information, contact the Office of Analysis, Nutrition, and Evaluation (OANE) at (703) 305-2117. Links to published studies and reports, including descriptions of ongoing studies conducted by OANE are available from the FNS at www.fns.usda.gov/oane/.

John R. Endahl, PhD; Patricia McKinney, Ed Herzog; and Matthew Sinn

RECENTLY COMPLETED RESEARCH
THE SCHOOL NUTRITION DIETARY ASSESSMENT STUDY-II.
This report provides an updated picture of the nutrient profile of National School Lunch Program (NSLP)/School Breakfast Program (SBP) meals, as well as current information about program operations and menu-planning practices used in school foodservice programs.

This study focused exclusively on public schools. Data were collected from nationally representative samples of 430 public school food authorities (SFAs) and more than 1,000 public schools participating in the NSLP. Schools provided information about all meals served during a one-week period between September 1998 and May 1999. The menus were compared to nutrition standards defined in NSLP/SBP regulations, which include goals of providing one-third (lunches) and one-fourth (breakfasts) of students’ daily needs for energy, and key nutrients and goals for fat and saturated fat content that are consistent with the Dietary Guidelines for Americans. Recommendations in the National Research Council’s (NRC) Diet and Health report also were used as standards for some additional nutrients and food components that were analyzed, but neither required nor quantified in NSLP/SBP regulations.

Overall, the study found that schools had made significant progress in meeting NSLP/SBP program standards.

Between school year (SY) 1991-92 and SY 1998-99, there was a meaningful and statistically significant trend toward lower levels of fat and saturated fat and increased levels of carbohydrates in school lunches, relative to calorie content.

In addition to improvement in overall means, there has been a marked increase in the percentage of individual schools that offered lunches that were consistent with the goals for fat and saturated fat.

The number of schools that enabled students to select lunches that provided no more than 30% of calories from fat over the course of a week dramatically increased. The percentage of elementary schools offering lowfat lunch options increased more than 2.5 times (from 34% to 82%), while the number of secondary schools offering lowfat lunch options increased 28% (from 71% to 91%).

Elementary schools are doing somewhat better at meeting the goals for fat and saturated fat content than are secondary schools in meals actually served to or selected by students.

In SY 1998-99, lunches served to students in elementary schools provided, on average, about 33% of calories from fat (compared to program standards of no more than 30%) and 12% of calories from saturated fat (compared to the standard of less than 10%). Approximately one in five elementary schools met the standard for calories from fat and 15% met the standard for calories from saturated fat.

Average lunches served in secondary schools in SY 1998-99 provided about 35% of calories from fat and 12% of calories from saturated fat. Fourteen percent of secondary schools met the standard of providing no more than 30% of calories from fat and 13% met the standard of less than 10% for saturated fat.

Positive changes in fat and saturated fat content of school lunches have been achieved without compromising the overall nutrient contribution of the meals. School lunches served to students in SY 1998-99 provided more than one-third of the Recommended Dietary Allowances (RDAs) for all targeted nutrients. Only lunches served in secondary schools, where students’ requirements are greatest, fell short of providing one-third of the recommended level of calories. Almost 70% of elementary schools met the standard for calories, while only 26% of secondary schools met the same standard.

School breakfasts have shown comparable improvements in relative fat and saturated fat content. Indeed, in both elementary and secondary schools, the relative fat content of the average breakfast served in SY 1998-99 was consistent with program goals for total fat and came very close to meeting the goal for saturated fat. The improvement in the fat and saturated fat profile of school breakfasts did not compromise achievement of the other nutritional goals of the program.

With the exception of calories, school breakfasts served in SY 1998-99 in both elementary and secondary schools met, or exceeded, the goal of providing one-fourth of the RDA for targeted nutrients.

Nutrient Content of School Meals Offered in SY 1991-92 vs. SY 1998-99

Lunches offered in SY 1998-99 provided significantly fewer calories from fat and saturated fat (33% to 34% vs. 38% and 12% vs. 15%, respectively) than lunches offered in SY 1991-92, but continued to exceed NSLP standards.

Average levels of sodium found in NSLP lunches were lower, but continue to exceed NRC recommendations. On the other hand, average cholesterol levels have decreased and continue to meet NRC recommendations.

Average SBP breakfasts offered in SY 1998-99 had significantly lower percentages of calories from fat and saturated fat.
and met SBP standards, while breakfasts offered in SY 1991-92 did not.

- Breakfasts offered in SY 1998-99 were significantly lower in cholesterol and sodium and had higher percents of calories from carbohydrates than breakfasts that were offered in SY 1991-92, and were consistent with NRC recommendations.

**THE SCHOOL MEALS INITIATIVE IMPLEMENTATION STUDY—YEAR 1.**

This report is the first in a series of reports to be issued as part of a three-year study of USDA's school-based child nutrition programs. This is the first national study following the start of the School Meals Initiative (SMI) for Healthy Children, and serves as an initial progress report on implementation of this far-reaching reform of the school meals program. The report findings are based on data collected from a nationally representative sample of over 2,000 school food authorities (SFAs) participating in the National School Lunch Program (NSLP) and School Breakfast Program (SBP), as well as data from the 50 state child nutrition directors responsible for the administration of these programs. Data were collected during school year (SY) 1997-98 through the use of self-administered mail surveys, and supplemented by telephone interviews where necessary.

**Overall Status of SMI Implementation**

- In SY 1997-98, a large majority of all school districts (81%) and schools (74%) were using one of the food-based menu-planning systems. About 20% of all districts were using Nutrient Standard Menu Planning (NSMP), while relatively few (3%) were using Assisted Nutrient Standard Menu Planning (ANSMP). About 6% of all districts were using more than one menu-planning system in their schools.
- More than 80% of the school districts indicated that they were at least halfway toward implementing their menu-planning systems with about one-third of all districts (35%) reporting that their menu-planning systems were fully implemented.
- About half of those school districts using food-based menu-planning systems in SY 1997-98 said that they were either working toward adoption of NSMP or planning to do so. Fewer of the largest school districts are contemplating the use of NSMP in their middle/secondary schools, with over two-thirds of these districts saying that they do not plan to move in this direction.
- Almost half of all districts are subjecting their menus to nutrient analysis, including one-third of the districts using food-based menu-planning methods. Of those districts conducting nutrient analysis, over three-fourths conduct a weighted analysis.
- Food-based menu-planning districts that do not use nutritional analysis to guide their menu-planning are taking a variety of steps to achieve the SMI nutritional objectives, including using more nutritious preparation techniques (81%), offering additional servings of more nutritious foods (77%), and substituting more nutritious foods and ingredients (77%).
- Most districts (83%) do not publicize the nutrient content of their menus.

**Impact of Nutrient Standard Menu Planning**

- Four tasks associated with NSMP were identified as being relatively labor intensive and posing a significant burden on the school districts: entering and analyzing recipes; obtaining missing nutrient information; entering and analyzing menus; and obtaining information for weighted analysis. The first three tasks are highly concentrated in the start-up phase of implementing NSMP.
- A strong majority of foodservice directors (76% at lunch, 66% at breakfast) reported that they spent more time in menu-planning after implementation of NSMP.
- About half of the NSMP districts reported difficulty in meeting the total calories goal for both breakfast and lunch, while about 45% reported difficulty in meeting the calorie goals for fat and saturated fat percentages in their lunch menus.
- Approximately 70% to 80% of the NSMP districts reported that their menus are "somewhat different" than before SMI, consistent with a gradual implementation of SMI.
- Eighty-four percent of elementary schools and 63% of middle/secondary schools in the NSMP/ANSMP districts reported "no change" in a la carte sales. To the extent that school districts do report a change in their a la carte sales, nearly all indicated increased sales. In addition, 35% of districts reported that middle/secondary schools with a la carte programs saw an increase in a la carte sales, while 16% of districts reported increased sales in elementary schools.

**Overall Impact of SMI on All School Districts**

- Many school foodservice directors reported making numerous changes in the menu-related features of their programs. This includes: increased number of fruit and vegetables offered (76%), increased number of new menu items (71%), increased portion sizes (54%), increased variation in menu items (42%), and an increased number of menu choices for reimbursable meals (36%).
- Most districts have made widespread changes in procurement practices, with 84% now requiring more information on nutrition from vendors (and 70% increasing their use of product specifications. Also, many reported increased purchases of lowfat/reduced-fat foods (81%) and fresh fruits and vegetables (76%).
- More than three-fourths (79%) of all districts said their overall program costs have increased since the implementation of SMI, driven largely by increased food costs.
- A majority of foodservice directors reported no change in food waste.
- Although the overall findings indicate that most school foodservice directors do not view the SMI as having an overwhelming positive impact, the effects are far more positive than negative. Almost 63% of all districts felt that the SMI was neutral in its impact, while 30% thought the program's effect had been positive and 7% thought it had been negative.
- School foodservice directors reported that major stakeholders in the school meals program—students, parents, administrators, cooks, cashiers, financial staff, and kitchen managers—have a decidedly positive attitude toward SMI. Nearly 70% of
and met SBP standards, while breakfasts offered in SY 1991-92 did not.

- Breakfasts offered in SY 1998-99 were significantly lower in cholesterol and sodium and had higher percents of calories from carbohydrates than breakfasts that were offered in SY 1991-92, and were consistent with NRC recommendations.

THE SCHOOL MEALS INITIATIVE IMPLEMENTATION STUDY—YEAR 1.

This report is the first in a series of reports to be issued as part of a three-year study of USDA's school-based child nutrition programs. This is the first national study following the start of the School Meals Initiative (SMI) for Healthy Children, and serves as an initial progress report on implementation of this far-reaching reform of the school meals program. The report findings are based on data collected from a nationally representative sample of over 2,000 school food authorities (SFAs) participating in the National School Lunch Program (NSLP) and School Breakfast Program (SBP), as well as data from the 50 state child nutrition directors responsible for the administration of these programs. Data were collected during school year (SY) 1997-98 through the use of self-administered mail surveys, and supplemented by telephone interviews where necessary.

Overall Status of SMI Implementation

- In SY 1997-98, a large majority of all school districts (81%) and schools (74%) were using one of the food-based menu-planning systems. About 20% of all districts were using Nutrient Standard Menu Planning (NSMP), while relatively few (3%) were using Assisted Nutrient Standard Menu Planning (ANSMP). About 6% of all districts were using more than one menu-planning system in their schools.

- More than 80% of the school districts indicated that they were at least halfway toward implementing their menu-planning systems with about one-third of all districts (35%) reporting that their menu-planning systems were fully implemented.

- About half of those school districts using food-based menu-planning systems in SY 1997-98 said that they were either working toward adoption of NSMP or planning to do so. Fewer of the largest school districts are contemplating the use of NSMP in their middle/secondary schools, with over two-thirds of these districts saying that they do not plan to move in this direction.

- Almost half of all districts are subjecting their menus to nutrient analysis, including one-third of the districts using food-based menu-planning methods. Of those districts conducting nutrient analysis, over three-fourths conduct a weighted analysis.

- Food-based menu-planning districts that do not use nutritional analysis to guide their menu-planning are taking a variety of steps to achieve the SMI nutritional objectives, including using more nutritious preparation techniques (81%), offering additional servings of more nutritious foods (77%), and substituting more nutritious foods and ingredients (77%).

- Most districts (83%) do not publicize the nutrient content of their menus.

Impact of Nutrient Standard Menu Planning

- Four tasks associated with NSMP were identified as being relatively labor intensive and posing a significant burden on the school districts: entering and analyzing recipes; obtaining missing nutrient information; entering and analyzing menus; and obtaining information for weighted analysis. The first three tasks are highly concentrated in the start-up phase of implementing NSMP.

- A strong majority of foodservice directors (76% at lunch, 66% at breakfast) reported that they spent more time in menu-planning after implementation of NSMP.

- About half of the NSMP districts reported difficulty in meeting the total calories goal for both breakfast and lunch, while about 45% reported difficulty in meeting the caloric goals for fat and saturated fat percentages in their lunch menus.

- Approximately 70% to 80% of the NSMP districts reported that their menus are "somewhat different" than before SMI, consistent with a gradual implementation of SMI.

- Eighty-four percent of elementary schools and 63% of middle/secondary schools in the NSMP/ANSMP districts reported "no change" in a la carte sales. To the extent that school districts do report a change in their a la carte sales, nearly all indicated increased sales. In addition, 35% of districts reported that middle/secondary schools with a la carte programs saw an increase in a la carte sales, while 16% of districts reported increased sales in elementary schools.

Overall Impact of SMI on All School Districts

- Many school foodservice directors reported making numerous changes in the menu-related features of their programs. This includes: increased number of fruit and vegetables offered (76%), increased number of new menu items (71%), increased portion sizes (54%), increased variation in menu items (42%), and an increased number of menu choices for reimbursable meals (36%).

- Most districts have made widespread changes in procurement practices, with 84% now requiring more information on nutrition from vendors (70% increasing their use of product specifications. Also, many reported increased purchases of lowfat/reduced-fat foods (81%) and fresh fruits and vegetables (76%).

- More than three-fourths (79%) of all districts said their overall program costs have increased since the implementation of SMI, driven largely by increased food costs.

- A majority of foodservice directors reported no change in food waste.

- Although the overall findings indicate that most school foodservice directors do not view the SMI as having an overwhelming positive impact, the effects are far more positive than negative. Almost 63% of all districts felt that the SMI was neutral in its impact, while 30% thought the program's effect had been positive and 7% thought it had been negative.

- School foodservice directors reported that major stakeholders in the school meals program—students, parents, administrators, cooks, cashiers, financial staff, and kitchen managers—have a decidedly positive attitude toward SMI. Nearly 70% of
PROFILE OF CHILDREN’S DIETS

These studies use extant data from the nationally representative Continuing Survey of Food Intakes by Individuals (CSFII) to examine the diets of school-age children. The first report, *Children’s Diets in the mid-1990s: Dietary Intake and Its Relationship with School Meal Participation*, uses data from the 1994-96 CSFII to examine the 24-hour dietary intakes of school-age children and the contribution of the school environment to those intakes. The second report, *Changes in Children’s Diets: 1989-91 to 1994-96*, uses data from both the 1989-91 and 1994-96 CSFII to examine how children’s 24-hour dietary intakes have changed over time. [Author’s Note: Financial support for the study was provided by the Economic Research Service of the U.S. Department of Agriculture.]

The key findings of “Children’s Diets in the Mid-1990s” are as follows:

**School-age Children’s Dietary Intakes**

- Children of all ages and genders are found to have mean vitamin and mineral intakes that exceed the Recommended Dietary Allowance (RDA). However, many children’s mean intakes of vitamin B-6, riboflavin, calcium, phosphorus, magnesium, and zinc are less than this dietary standard, and their mean intake of calcium is below the Adequate Intake (AI).
- Teenage girls are at especially high risk of having low vitamin and mineral intakes. In part, this is due to the finding that nearly 20% of females ages 14 to 18 skipped breakfast both days on which CSFII reported the intakes. They also were found to have low intakes of fruit and vegetables, and 70% to 80% of females ages nine and older met Healthy Eating Index food group targets for none or only one of the five major food groups.
- Non-Hispanic blacks are at increased risk of low or inadequate intakes of calcium, phosphorus, and vitamin A, and also are very unlikely to meet the dietary recommendations for total intakes of fat, saturated fat, and sodium.
- Only 2% of the children meet Food Guide Pyramid recommendations for all five major food groups.
- Only small percentages of children meet the dietary recommendations for total fat, saturated fat, fiber, and sodium intakes. Furthermore, added sugar contributes 20% of the total food energy to children’s diets.
- Overall, 50% to 85% of children (depending on age and gender) consume soda on a given day. Teenage males are particularly heavy consumers, with more than one-third consuming more than three servings a day.

**Relationship Between School Meal Participation and Dietary Intake**

- Twenty percent of all school children not participating in the SBP skip breakfast on an average school day.
- NSLP participation is associated with higher mean intakes of food energy, vitamins B-6 and B-12, riboflavin, calcium, phosphorus, magnesium, and zinc, both at lunch and over 24 hours.
- NSLP participants have higher mean intakes of total fat, saturated fat, and sodium than non-participants have at lunch and over 24 hours. However, NSLP participants have lower intakes of added sugars at lunch and over 24 hours than non-participants.
- NSLP participants are more likely than non-participants to consume vegetables, milk and milk products, and meat and meat substitutes, both at lunch and over 24 hours. Participants also consume less soda, fruit drinks, and fruit-flavored drinks.
- SBP participation is associated with higher intakes of food energy, calcium, phosphorus, and vitamin C.
- Students who participate in both the school breakfast and school lunch programs are more likely to have usual intake on school days meeting the dietary standards for intake of vitamins B-6 and B-12, riboflavin, calcium, iron, magnesium, phosphorus, and zinc than students who participate in neither program. However, participants are less likely to meet the standards for sodium and caloric percentages from total fat and saturated fat. Participants also have higher mean intakes at school and over 24 hours for food energy, seven vitamins and minerals, total fat, saturated fat, fiber, and sodium.

**Highlights of Changes in Children’s Diets:**

- Children’s intakes of most vitamins and minerals did not change much over this period. Males were more likely to experience increases in mean vitamin and mineral intake, and white children were more likely to experience increases than other racial and ethnic groups.
- Regardless of age or gender, children’s fat intake as a percentage of food energy decreased between 1989-91 and 1994-96, although absolute intake of fat did not decline. However, for black and Hispanic children, total fat intake as a percentage of food energy stayed about the same. In 1989-91, 14% of children met the overall guideline for fat intake and 7% met the guideline for saturated fat. By 1994-96, these percentages had nearly doubled to 25% for total fat and 16% for saturated fat.
- Overall, children’s cholesterol intake decreased, but cholesterol intakes among children ages 14 to 18 and among blacks and Hispanics did not decrease significantly. Fiber intake increased, with the increase being strongest among children ages 14 to 18 and white children.
- Children increased their consumption of vegetables and grain products and consumed fewer milk products and meat and meat substitutes. However, most children still failed to meet the recommended consumption levels for the five major food groups.
- In 1989-91 and 1994-96, children’s beverage consumption shifted from high-fat milk to lower-fat milk, soda, and fruit and fruit-flavored drinks.

**THE STUDY OF DIRECT CERTIFICATION IN THE NATIONAL SCHOOL LUNCH PROGRAM (NSLP).**

- This report provides national estimates of the usage of direct certification in 1996 by public school districts participating in the NSLP and their state agencies. Direct cer-
SCHOOL BREAKFAST PILOT PROJECT EVALUATION.
The U.S. Department of Agriculture's Food and Nutrition Service (FNS) has begun an evaluation of a Congressionally mandated three-year School Breakfast Program (SBP) Pilot Project. The six school food authorities (SFAs) selected to participate in this pilot project are: Harrison County School District, Gulfport, Miss.; Independent School District of Boise City, Boise, Idaho; Santa Rosa City Schools, Santa Rosa, Calif.; Shelby County Board of Education, Columbiana, Ala.; Washington Elementary School District, Phoenix, Ariz.; and Wichita Public Schools, Wichita, Kan. The school districts will offer free breakfasts to all students in a limited number of schools, regardless of their family income.

The evaluation will rigorously assess the effects of this universal free school breakfast program on student participation and a broad range of student outcomes, including academic achievement, school attendance and tardiness, classroom behavior and attentiveness, and dietary status. It also will examine how the universal free breakfast program was implemented, its costs, and any changes to program operations. Data collection activities will include collection of school administrative records, student achievement and cognitive testing, dietary intake, surveys of students and their parents, surveys of school and foodservice personnel, and site visits.


NSLP APPLICATION AND VERIFICATION PILOT PROJECTS.
Twenty-one school food authorities (SFAs) and two state agencies currently are involved in a three-year demonstration to test alternative application, approval, and verification procedures for free/reduced-price meal eligibility determination. The types of pilot projects that were initiated at the start of this school year include:

- Households submit corroborating documentation when they submit their application for free or reduced-price meal benefits (9 SFAs).
- SFAs verify the eligibility of directly certified children (6 SFAs).
- SFAs conduct verification in several rounds. The SFA conducts later rounds only if the SFA finds significant error rates in earlier rounds (4 SFAs).
- Two SFAs designed their own pilot procedures that were approved by FNS (2 SFAs).
- Two state agencies designed their own pilot procedures, which were approved by FNS (Minnesota and Mississippi).

FNS will conduct basic assessments of pilot performance by analyzing administrative data for each of the three pilot school years and two preceding school years. An interim report is expected at the end of the current school year. FNS is working with the USDA to secure funding that would support contracted collection of additional information needed to evaluate whether the pilots' outcomes are consistent with the goals of the National School Lunch Program.
The Journal of Child Nutrition & Management Subscription Form

ASFSA Membership Number

Name

Title

Address


Subscription Rate: (check one)

☐ Member $25.00

☐ Nonmember $29.00

$ __________ Total Amount Enclosed

Date

Signature

The Journal of Child Nutrition & Management publishes two issues each year. Your subscription entitles you to both issues. Please make checks payable to ASFSA and mail this form to ASFSA, 700 S. Washington St., Suite 300, Alexandria, VA 22314-4287.

Some back issues are available for $19.50 each. For availability, call (800) 877-8822, ext. 120.

If you currently subscribe to The Journal you will be sent a separate renewal notice.

Please answer the following questions:

1. What is your job title?

2. Are you a member of the American School Food Service Association?  ☐ yes  ☐ no

3. If yes, to which membership section do you belong:

☐ District Directors/Supervisors

☐ Major City Directors/Supervisors

☐ State Directors/Supervisors

☐ Managers

☐ Employees

☐ Educators

☐ Industry

4. How long have you subscribed to The Journal of Child Nutrition & Management?

5. How did you first learn about The Journal of Child Nutrition & Management?


7. What do you believe are benefits you receive from reading The Journal of Child Nutrition & Management?

8. What changes would you like to see made to The Journal of Child Nutrition & Management?
Guide to Authors & Submission Requirements

The Journal of Child Nutrition & Management contains research articles focusing on many aspects of school-based foodservice programs and operations, including food quality and production, operations management, program evaluation, nutrition standards, and nutrition education. With the exception of works developed as a result of projects funded by the U.S. government, manuscripts must be original, unpublished, and not submitted for publication elsewhere. Membership in the American School Food Service Association (ASFSA) is not a prerequisite for submitting manuscripts.

**Primary Audience**
The primary audience of The Journal of Child Nutrition & Management is school foodservice/child nutrition professionals at the district and state director levels. Other readers include those involved in nutrition public policy, students, school administrators, college and university faculty, researchers, and industry R&D and marketing staff.

**Article Categories**
The Journal of Child Nutrition & Management accepts manuscripts in the following four categories: Commentary, Current Issues, Research in Action, and Practical Solutions. Each manuscript will be evaluated through a blind peer review process, considering many factors, including, but not limited to: content, originality, article readability, active style of writing, results and discussion, conclusions, quality and use of tables and figures, applications for school foodservice operators, proper term definition, referencing of statements of fact, and methodology. Manuscripts will be rejected if they are deemed inappropriate for The Journal of Child Nutrition & Management, or if they do not conform to the following category guidelines.

1. **Commentary:** Should be a brief opinion piece on a timely subject that stimulates thought, challenges the status quo, and provides suggestions for action or areas for research. Charts/tables/figures/illustrations should not be submitted in this category. **Article Length: up to 1,500 words, including References.**

2. **Current Issues:** May be a review of literature or a discussion of a subject of current interest or controversy. The article may include references and charts/tables, but should not discuss data collection or methodology in detail. Papers should include an Abstract (see below, under "Research in Action"). No more than **three** charts/tables/figures/illustrations should be submitted in this category. **Article Length: up to 2,500 words, including Abstract and References.**

3. **Research in Action:** Papers should report original research and include all of the following sections clearly labeled and in the order listed below. No more than **four** charts/tables/figures/illustrations should be submitted in this category. **Article Length: up to 4,500 words, including Abstract and References.**

   - **Abstract:** Briefly state the purpose of the research and provide an overview of the methodology, major findings, and application to practice. **Percentage of article: 10%—not to exceed 450 words.**
   - **Introduction:** State the purpose of the study and provide a brief discussion of relevant literature. **Percentage of article: 15%—not to exceed 675 words.**
   - **Methodology:** Briefly describe the research sample, the research instruments used, and how data were collected and analyzed. Submit (for review only) any questionnaires or other test instruments used in the research to allow reviewers to assure the validity of the methods used. **Percentage of article: 15%—not to exceed 675 words.**
   - **Results and Discussion:** Present findings of the research, discuss their significance, and, if possible, relate the new information to previous knowledge of the topic area. **Percentage of article: 30%—not to exceed 1,350 words (not including charts, tables, and illustrations).**

4. **Practical Solutions:** Papers should describe a problem or challenge faced by a school foodservice operation, and discuss how a partnership between the operation and the academic community solved the problem and led to enhanced operational effectiveness and efficiency. The paper also may offer suggestions for possible future research on the topic. Papers should include an Abstract (see above, under "Research in Action"). No more than **three** charts/tables/figures/illustrations should be submitted in this category. **Article Length: up to 2,500 words, including Abstract and References.**

**Style of Articles**
In addition to meeting the criteria of the above article categories, all manuscripts should be written in a direct, active voice and an easy-to-understand manner that makes both the research and results understandable to the practitioner. Avoid heavily academic, technical language, and explain technical terms. Before submitting a paper for publishing consideration, authors in the academic community may wish to have a practitioner in their local area review the paper for clarity and practical application.

**Manuscript Preparation**
Submit four copies of the manuscript for the peer review process; type manuscripts double-spaced on 8½ x 11-inch paper with 1-inch margins on all edges. Number each page...
clearly, as an aid to reviewers, please number each line of manuscript copy down the left margin, beginning each page with line 1. Upon acceptance, submit two print copies, with all line and page numbering removed, and a file on a 3.5-inch diskette in a recognized word processing program (e.g., Microsoft Word, WordPerfect). Assemble your material for submission in the order described below.

**Title Page:** The title page should be the first page of the manuscript and should include the title of the article; article category the manuscript is being submitted in; word count for the total manuscript, as well as each individual section; the name, professional suffixes, job title, place of employment, and addresses of all authors; and the phone number and mailing address of the person who should receive the galley proof (corresponding author). Identify authors on the title page only, so the manuscript can be reviewed confidentially.

**Abstract:** On a separate sheet of paper, include the title of the article as well as a summary of the paper (see Abstract under "Research in Action" above).

**Text:** Write in active voice and according to requirements of the appropriate article category described above.

**Acknowledgements:** These may include acknowledgement of technical assistance, sources of financial support, or identification of a thesis, dissertation, presentation, or preliminary report from which data were taken.

**Tables:** Type each table double-spaced on a separate sheet and number sequentially and identify each with a short title. Preferably, tables should be formatted in a recognized software program (e.g., Microsoft Excel or Word). Limit tables to those essential for clarification. (See article categories for maximum number to submit.)

**References:** Use only references cited in the text. Type double-spaced on a separate sheet and in alphabetical order. Follow the American Psychological Association (APA) style for references.

**Illustrations, Figures, and Charts:** These should be professionally drawn or prepared on a computer. Submit one camera-ready copy (e.g., on a high-contrast, glossy, black-and-white print copy), as well as a high-quality photocopy with each copy of the manuscript. These should be no larger than 8½x11 inches. Include the author’s name and address, and any illustration credit information on a label affixed to the back of all copies of the illustration. Limit illustrations to those essential for clarifying the text.

**The Review Process**
Authors will receive written acknowledgement of the initial receipt of their manuscript. All submitted manuscripts are then sent to peer reviewers who are experts in their fields. After peer review (usually 10 to 12 weeks after the date of the initial acknowledgement letter), the editor will notify the corresponding author whether the manuscript has been accepted as is, with revision, or rejected. In the case of required revisions, the disk, one copy of the manuscript, and the reviewers’ evaluation will be returned.

The American School Food Service Association (ASFSA) holds the copyright on all material published in *The Journal*. Therefore, upon acceptance, all authors must sign and date a statement that transfers their article’s copyright to ASFSA. Manuscripts submitted by authors who were employees of the U.S. federal government at the time their work was investigated and written are not subject to the Copyright Act; therefore, these authors will not be required to submit the statement of copyright transfer but must inform the Editor of their status as federal employees.

**For More Information, Contact:**
The Journal of Child Nutrition & Management
Jeannie Sneed, PhD, RD, SPNS, Editor
Iowa State University
Hotel, Restaurant and Institution Management
11 MacKay Hall
Ames, IA 50011-1120
(515) 294-8474 (phone)
(515) 294-8561 (fax)
jsneed@iastate.edu

---

**Final Checklist**
Before submitting a manuscript for review, please consult the following checklist of requirements to ensure the paper meets *The Journal’s* standards for publication. The Editor can and will reject manuscripts that do not meet the specified criteria.

- Have you submitted four copies of the manuscript prepared according to the guidelines?
- Have you attached a complete Title Page?
- Have you included an Abstract page, with the title and summary only?
- Have you provided author biographical information?
- Have you included Acknowledgements (if applicable)?
- Have you included and properly formatted References?
- Have you met the guidelines regarding tables/charts/figures/illustrations?
- Have you indicated an article category?
- Is the text written in an active voice, and can it be easily understood by practitioners?
- Have you numbered the lines of the manuscript?
Planning to attend ASFSA's Annual National Conference in Nashville this summer?

Be sure you don’t miss the Child Nutrition Showcase

Monday, July 16 and Tuesday, July 17.

Hosted by ASFSA's College Personnel Section, this annual event (formerly known as the Poster Session) will feature visual displays of innovative ideas, programs and research being conducted by school foodservice and nutrition professionals around the country. At the Child Nutrition Showcase, you’ll find:

- findings of recent research studies
- best practices in nutrition education; training and staff development; and marketing and customer service
- examples of innovative facility design

Poster authors will be available on Tuesday, July 17, from 11 a.m. – 1 p.m. to discuss their materials and answer your questions.

And if you can’t make it to Opryland this summer, abstracts of the posters featured in the Child Nutrition Showcase will be published in the Fall 2001 issue of The Journal of Child Nutrition & Management.