How the CATCH Eat Smart Program Helps Implement the USDA Regulations in School Cafeterias

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This article describes the implementation of the U.S. Department of Agriculture's National School Lunch Program (NSLP) standards in school lunch menus in 56 intervention and 20 control schools from the Child and Adolescent Trial for Cardiovascular Health (CATCH) 5 years after the main trial, compared with 12 schools previously unexposed to CATCH. School food service personnel completed questionnaires to assess CATCH guideline implementation, demographic data, behavioral constructs, training, program material use, and participation in competing programs. Five days of menus and recipes were collected from school cafeteria staff, averaged, and compared to USDA School Meal Initiative (SMI) standards. Significant differences between intervention and unexposed schools were found for training and knowledge of CATCH and in mean percentage energy from fat and carbohydrates. Intervention schools most closely met USDA SMI recommendations for fat. Thus, the CATCH Eat Smart Program assisted school cafeterias in meeting USDA guidelines 5 years postimplementation.

Keywords: *institutionalization; cardiovascular health promotion programs; school food service; child nutrition services; nutrition*

The School Meal Initiative for Healthy Children (SMI), part of the Healthy Meals for Healthy Americans Act of 1994[1] was focused on bringing the nutrient composition of school meals closer to the recommendations of the Dietary Guidelines for Americans.[2,3]

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The impetus for this legislation was the School Nutrition Dietary Assessment Study (SNDAS) that indicated that school lunches and other school meals were higher in fat and saturated fat than recommendations. Thus, children who participated in the school meal program were likely to consume too much of these nutrients.[4] Because modifying school meals can significantly affect children's diets,[5-7] the intent of the SMI was to bring the mean nutrient content of school meals in line with current U.S. Dietary Guidelines by 2005, to have a positive impact on child diets overall.[1] Current regulations mandate that school meals provide less than or equal to 30% of energy from fat and less than or equal to 10% of energy from saturated fat, while maintaining an adequate energy content for child growth and development including adequate intakes of nutrients such as protein, calcium, iron, vitamin A, and vitamin C.[1] Recent data from the School Nutrition Dietary Assessment–II (SNDA-II), conducted in 1998-1999, indicated that after the enactment of the SMI, school lunches were significantly lower in fat and saturated fat. However, menus as offered in 82% of elementary schools were still not meeting the National School Lunch Program (NSLP) standards for total fat, and 85% were not meeting NSLP standards for saturated fat[8]

The Child and Adolescent Trial for Cardiovascular Health (CATCH) was a randomized, school-based health education program that addressed cardiovascular risk reduction in elementary students in Grades 3-5 in 1991-1994, conducted at four sites across the United States: San Diego, California; New Orleans, Louisiana; Minneapolis, Minnesota; and Austin, Texas.[9,10] The New England Research Institutes served as the Data Coordinating Center. The Eat Smart Program, the school food service component of CATCH, was implemented during the main trial (1991-1994), before SMI standards were enacted. The nutritional goals of Eat Smart were to provide school meals with an average of 30% or less of energy from fat, 10% or less of energy from saturated fat, and a sodium content of 600 to 1,000 mg while maintaining levels of other United States Department of Agriculture (USDA) required nutrients.[11] Thus, former CATCH intervention schools were essentially implementing SMI standards 2 years before the regulations went into effect across the United States.

The purpose of this article is to describe the impact the CATCH Eat Smart Program had on implementation of the USDA SMI standards 5 years postintervention by describing the extent to which the SMI standards were achieved and sustained in the long run by the CATCH former intervention school and former control school cafeterias compared with school cafeterias that were not exposed to CATCH. In addition, components associated with successful implementation of the USDA regulations are examined.

METHOD

Study Design

During the CATCH main trial from 1991-1994, intervention school cafeterias received Eat Smart intervention materials, staff training, and ongoing support visits by research staff. At the end of the main trial (1994), the comparison school cafeterias received Eat Smart materials and were offered a 1-day in-service training session on the program. There was no additional contact with the original CATCH schools or school cafeterias for training, booster sessions, or provision of materials throughout the intervening period.

The CATCH institutionalization study was conducted 5 years (1998-1999) after the conclusion of the main study trial. For the institutionalization study, 12 additional schools

from neighboring school districts were recruited with no prior exposure to CATCH during the previous 5 years (unexposed control). Additional details on the study design are described elsewhere.[12]

Study Sample

Schools participating in the 1998-1999 study were recruited from the four original CATCH field centers and were selected to be similar to previous CATCH schools in most demographic characteristics, such as school size and percentage economically disadvantaged children. All former CATCH intervention schools ($n = 56$) were recruited, as were 20 randomly selected former CATCH control schools (from the original 40 control schools) and the 12 schools that had been unexposed to CATCH in 1991-1994. All schools (previous CATCH schools and the newly selected unexposed schools) were public elementary schools with Grades 3-5 on campus and did not include magnet or special service schools.

Human research approvals were obtained by Institutional Review Boards at each CATCH institution and the CATCH Coordinating Center. Letters of agreement from school districts to participate in the CATCH institutionalization study were also obtained at each of the study centers.

Measures

All food service instruments were pretested with food service staff at schools that were not included in the study prior to use. In addition, protocols and instruments were developed using previous versions of Eat Smart evaluation tools used during the main CATCH trial.

School Demographics. School characteristics were measured using a School Health Survey for Principals, which assessed the demographics of the school (e.g., total enrollment, percentage free and reduced-price lunch, percentage minority, etc.), other health education programs offered at the school, physical facilities and resources, and school health-related policies. This questionnaire was completed by the school principal or another designated administrator at the school level.

Menu Documentation. The nutrient content of school lunch menus was determined using 5 days of menu and recipe documentation in each school cafeteria using the same protocols as in the CATCH main trial.[9,13,14] Trained observers collected recipes, menus of school lunches offered, and vendor product information for 5 consecutive days from school food service personnel at each school cafeteria during the spring of 1999. In addition, production records were used to record the number of each meal component served to obtain a proxy for student consumption of the meal.

Eat Smart Guidelines Checklist. An Eat Smart Guidelines[11] Checklist was administered to each district child nutrition services director or their designate and to school cafeteria managers at each school. This survey was developed using the 30 Eat Smart guidelines and was divided into school- and district-level surveys. Questions about cafeteria food preparation and food production were listed on the school level survey, whereas menu planning and food purchasing guidelines were covered on the district-level survey because planning for the latter was generally done centrally. Eat Smart Guideline check-

list implementation was assessed using a Likert-type scale that ranged from 1 (*never used*) to 5 (*always used*), as well as a category for *not applicable.*

Food Service Staff Questionnaires. A School Food Service Staff Questionnaire was administered to district food service personnel and cafeteria managers and cooks to obtain information on behavioral constructs such as self-efficacy, attendance at training sessions, use of Eat Smart materials, and respondent demographics and school food service experience. Separate versions of the questionnaire were developed for district personnel responsible for purchase of foods and planning of menus, and for cooks/technicians who participated in food preparation and service. Questions were derived from school staff questionnaires used during the main intervention trial as well as new questions that were developed by the CATCH researchers. Items that specifically asked about CATCH materials, training, and so on were only included on surveys distributed to former intervention and control cafeteria staff because such materials had never been provided to the other schools. Questionnaires with anonymous identification codes were distributed to food service personnel and collected after completion.

Service Secular Trends Questionnaires. A questionnaire designed to determine the extent of competing food service programs in the cafeteria was administered to cafeteria managers/head cooks of all schools. Programs that were designed to lower fat and sodium in school meals were targeted in this questionnaire.

Statistical Methods

The Eat Smart intervention was implemented at the school level, and schools rather than the students were randomly assigned to either the intervention or control group; therefore, the unit of analysis was the school. The sample size for all analyses is 88 (56 intervention schools, 20 randomly selected control schools, and 12 previously unexposed schools). After the conclusion of CATCH, two schools in Louisiana split into separate schools with grades K-3 versus grades 4-6. Data collected from split schools were combined in the analysis, and split schools retained their original CATCH treatment assignment.

Data collected on individuals (e.g., students, food service staff, and principals) were aggregated at the school level by summing or averaging responses within a school. Unadjusted means and standard deviations were calculated by condition for total student enrollment and demographics, school lunch participation, school operating budget, food service staff attitudes regarding preparation of school meals lower in fat and sodium, competing programs, Eat Smart guidelines, and local efforts to reduce fat and sodium in school meals. Differences across treatment groups were assessed using a one-way analysis of variance and the Kruskal-Wallis test. Self-reported health characteristics of cooks, CATCH awareness, and past training on CATCH Eat Smart materials were calculated overall and by school condition and compared using Fisher's Exact test.

School lunch menus, as offered and as served, were compared across treatment conditions for total energy, fat, and saturated fat, in addition to protein, carbohydrates, sodium, cholesterol, calcium, iron, and vitamins A and C. Conversion of menus into a nutrient database was performed using the Nutrition Data System for Research (NDS-R) software version 4.01, developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, Food and Nutrient Database 29, released December 1998. If an analytic value was not available for a nutrient in a food, the NCC calculated the value on the

basis of the nutrient content of the nutrients in the same food or on a product ingredient list, or estimated the value based on the nutrient content of similar foods. A missing value was allowed only if (1) the value was believed to be negligible, (2) the food was usually eaten in very small amounts, (3) it was unknown if the nutrient existed in the food at all, or (4) there was no way to estimate the value because the food was unlike any other.[15] Portion sizes appropriate to the USDA meal pattern for fifth graders were used for all analyses.

The database for total nutrient content of a school lunch, as offered and as served, was constructed using the 1988 USDA NSLP meal patterns, which specified minimum quantities and the number of servings required from each of four meal component categories: meat or meat alternate, vegetable and/or fruit, bread or bread alternate, and milk. For the as-offered analysis, multiple food choices within a given meal component were averaged and then weighted by the number of items the student was allowed to select from the meal component. In the as-served analysis, every food item was weighted by the fraction of students served the item. In either case, resulting nutrient values were summed across food items to obtain total nutrients for each menu. Five-day school lunch averages were calculated for each nutrient of interest to serve as outcome measures. Comparison of school lunch menus across conditions was accomplished using analysis of variance, adjusted for CATCH site; *p* values were adjusted for multiple comparisons using the Tukey-Kramer method.

The relation of schools meeting eight USDA guidelines to competing programs and school staff questionnaire data was investigated using logistic regression (1 = *met all eight USDA guidelines* vs. 0 = *did not meet at least one USDA guideline*), adjusted for CATCH site. USDA guidelines included eight variables for nutrient guidelines for students in grades K-6: (1) energy level of 664 kcal, (2) total fat content of 30% kcal or less, (3) saturated fat content of 10% kcal or less, (4) at least 10 g protein, (5) at least 286 mg calcium, (6) at least 3.5 mg iron, (7) at least 224 retinol equivalent (RE) vitamin A, and (8) at least 15 mg of vitamin C.[16] Due to partial separation in the data, exact logistic regression was used for some of the outcomes. Results were consistent with the asymptotic analyses, and only the latter are reported. All analyses were performed with the Statistical Analysis System (Version 8.2, 2000, SAS Institute, Inc., Cary, NC).

RESULTS

The characteristics of the schools participating in the CATCH institutionalization study are shown in Table 1. Schools were similar in all demographic characteristics, except those related to competing food service programs. Cafeterias from 30.4% of former intervention schools and 41.7% of unexposed schools cited at least one competing food service program, compared with 5.0% of cafeterias from former control schools ($p < .05$).

Cooks from the different schools were similar in their self-reported health characteristics (data not shown). Although less than one-third reported practicing health behaviors "more than others" for all cooks/technicians, a majority of cooks/technicians reported engaging in healthful levels of physical activity (65.9% overall), eating a healthful diet (86.4% overall), and being tobacco free (89.8% overall). In addition, there were no differences among former intervention, former control, and unexposed cafeterias in self-efficacy for preparing foods low in fat and sodium, the importance of encouraging children to eat a diet low in fat and sodium, or the importance of teaching heart health in schools (Table 2). However, food service personnel from former intervention and control

Table 1. Characteristics of Schools Participating in CATCH-ON (1998-1999)

	Former Intervention Schools (n = 56)		Former Control Schools (n = 20)		Unexposed Schools (n = 12)	
	M	*SE*	*M*	*SE*	*M*	*SE*
	n	%	*n*	%	*n*	%
Students per school	526	18.1	539	30.3	613	39.1
Ethnicity (%)						
White	61.4	3.9	54.9	6.6	51.3	8.5
Black	17.1	2.5	18.6	4.3	26.5	5.5
Hispanic	17.6	3.0	22.5	5.0	18.7	6.4
Male	51.7	0.3	50.9	0.6	51.7	0.8
School lunch participation (%)						
Overall	74.9	2.2	79.0	3.6	77.2	4.6
Free lunch	37.5	3.3	47.1	5.6	43.7	7.2
Reduced-price lunch	10.7	0.9	11.1	1.5	9.5	2.0
Total operating budget ($M)	2.1	0.1	2.3	0.1	2.1	0.2
School food service cooks						
Cooks per school	3.4	0.3	4.1	0.4	4.4	0.6
Years in current position	7.2	0.5	6.9	0.9	8.6	1.1
Years of food service experience	9.9	0.6	9.9	1.0	12.4	1.3
Non-CATCH initiatives						
Competing food service programs	17	30.4[a]	1	5.0[b]	5	41.7[a]
Individual efforts to reduce fat	15	26.8	2	10.0	4	33.3
Individual efforts to reduce sodium	13	23.2	1	20.0	4	33.3

NOTE: Differences in means and percentages tested with analysis of variance and Fisher's Exact test, respectively. Estimates with dissimilar superscripts indicate significant differences at $p < .05$. CATCH = Child and Adolescent Trial for Cardiovascular Health; CATCH-ON = CATCH: A Study of Institutionalization.

schools were significantly more likely to have heard of CATCH than those in the unexposed schools (83.9% and 75.0% compared with 8.3%), and intervention schools were significantly more likely to have been trained in the Eat Smart Program than both former control and unexposed schools (57.1% compared with 15.0% and 0%, respectively).

At 30.7% and 10.4%, the mean percentage energy from fat and saturated fat from former intervention schools came closest to meeting the SMI standards of 30% of energy from fat and 10% of energy from saturated fat. School lunch menus from former intervention schools as offered (Table 3) were significantly lower in percentage energy from fat compared with menus from former control (30.7 ± 0.4% versus 33.2%, $p = .004$). In addition, lunch menus from former intervention schools were higher in percentage energy from carbohydrates than menus from former control schools (53.9% versus 52.1%, $p < .05$). Although the percentage energy from fat was higher in menus from unexposed schools (32.1%) compared to former intervention schools (30.7%), this difference was not statistically significant. Menus as served from intervention schools were not significantly different from menus from former control or unexposed schools, except for percentage of energy from protein, which was lowest in unexposed schools (Table 3).

Table 2. Attitudes About Preparing School Foods Lower in Fat and Sodium, and Recognition and Use of CATCH Materials in Food Preparation, Among Cafeteria Staff (food service managers, directors, cooks, and technicians)

Variable	Overall (N = 88)		Former Intervention (n = 56)		Former Control (n = 20)		Unexposed (n = 12)	
	M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
	N	%	n	%	n	%	n	%
Attitudes								
Self-efficacy for preparing foods low in fat (response scale: 1 = *not at all confident* to 5 = *extremely confident*)	3.9	0.1	4.0	0.1	3.8	0.1	3.7	0.2
Importance of encouraging children to eat a diet low in fat (response scale: 1 = *not at all important* to 5 = *extremely important*)	4.4	0.1	4.5	0.1	4.3	0.1	4.5	0.2
Self-efficacy for preparing foods low in sodium (response scale: 1 = *not at all confident* to 5 = *extremely confident*)	3.8	0.1	4.0	0.1	3.6	0.2	3.4	0.2
Importance of encouraging children to eat a diet low in sodium (response scale: 1 = *not at all important* to 5 = *extremely important*)	4.3	0.1	4.4	0.1	4.1	0.2	4.2	0.2
Importance of teaching about heart health in elementary schools (response scale: 1 = *not at all important* to 5 = *extremely important*)	4.7	0.1	4.7	0.1	4.6	0.1	4.9	0.1
CATCH								
Heard of CATCH	63	71.6	47	83.9[a]	15	75.0[a]	1	8.3[b]
Trained on CATCH Eat Smart	35	39.8	32	57.1[a]	3	15.0[b]	0	0.0[b]

NOTE: Differences in means and percentages tested with analysis of variance and Fisher's Exact test, respectively. Estimates with dissimilar superscripts indicate significant differences at $p < .05$. CATCH = Child and Adolescent Trial for Cardiovascular Health.

Table 3. Comparison of School Lunch Menus Across Treatment Groups, as Offered and as Served During CATCH-ON

	Menus as Offered						Menus as Served					
	Former Intervention (n = 56)		Former Control (n = 20)		Unexposed (n = 12)		Former Intervention (n = 56)		Former Control (n = 20)		Unexposed (n = 12)	
	M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Energy (kcal)	749.9	12.7	768.3	21.3	741.9	27.5	702.9	12.6	708.1	21.1	708.2	27.3
Total fat (g)	26.0	0.8	28.4	1.3	26.6	1.7	24.1	0.6	25.3	1.0	25.8	1.3
Total fat (% kcal)	30.7	0.4[a]	33.2	0.7[b]	32.1	0.8[ab]	30.7	0.4	32.2	0.7	32.8	0.9
Total SFA (g)	8.7	0.2	9.4	0.4	9.1	0.5	8.2	0.2	8.8	0.4	8.9	0.5
Total SFA (% kcal)	10.4	0.2	11.0	0.3	10.9	0.4	10.4	0.2	11.2	0.3	11.1	0.4
Protein (g)	31.7	0.4	31.6	0.7	31.2	0.9	30.3	0.5	30.2	0.9	28.5	1.2
Protein (% kcal)	17.0	0.2	16.5	0.3	16.9	0.4	17.3	0.2[a]	17.1	0.3[ab]	16.2	0.3[b]
Carbohydrates (g)	100.6	1.5	99.9	2.5	97.6	3.2	93.7	1.8	92.4	2.9	93.3	3.8
Carbohydrates (% kcal)	53.9	0.4[a]	52.1	0.6[b]	52.8	0.8[ab]	53.4	0.4	52.2	0.7	52.7	0.9
Sodium (mg)	1,366.7	36.6	1,383.7	61.2	1,457.4	79.0	1,343.6	28.6	1,322.2	47.8	1,418.2	61.7
Cholesterol (mg)	61.6	1.8	62.1	3.0	64.1	3.9	61.7	1.7	60.3	2.8	59.8	3.6
Calcium (mg)	526.9	7.4	541.9	12.4	493.8	16.0	465.6	12.4	474.2	20.8	413.9	26.9
Vitamin A (RE)	417.1	18.3	422.1	30.6	431.9	39.5	310.4	10.8	313.3	18.0	280.6	23.3
Vitamin C (mg)	30.5	1.4	30.1	2.3	30.6	3.0	22.7	1.0	21.2	1.6	24.7	2.1
Iron (mg)	4.7	0.1	4.7	0.1	4.6	0.2	4.6	0.1	4.6	0.1	4.4	0.2

NOTE: Mean (*SE*) from analysis of variance, adjusted for site. Means with nonmatching superscripts indicate significant differences at $p < .05$. CATCH = Child and Adolescent Trial for Cardiovascular Health; CATCH-ON = CATCH: A Study of Institutionalization; SFA = saturated fatty acids; RE = retinol equivalent.

Table 4. Number and Percentage of Schools That Met the USDA Guidelines[a] for Selected Nutrients in Menus as Offered by Treatment Group (N = 88)

	Intervention (n = 56)		Control (n = 20)		Unexposed (n = 12)	
USDA Guideline	*n*	%	*n*	%	*n*	%
Energy (≥ 664 kcal)	52	92.9	18	90.0	8	66.7
Total fat (≤ 30% kcal)	47	83.9	15	75.0	10	83.3
Saturated fat (≤ 10% kcal)	49	87.5	15	75.0	10	83.3
Protein (≥ 10 g)	56	100.0	20	100.0	12	100.0
Calcium (≥ 286 mg)	56	100.0	20	100.0	12	100.0
Iron (≥ 3.5 mg)	53	94.6	19	95.0	10	83.3
Vitamin A (≥ 224 RE)	55	98.2	20	100.0	12	100.0
Vitamin C (≥ 15 mg)	56	100.0	20	100.0	11	91.7

NOTE: No significant differences across treatment groups were found using Fisher's Exact test. USDA = U.S. Department of Agriculture.

a. USDA guidelines included eight variables for nutrient guidelines for students in Grades K-6: (1) energy level of 664 kcal, (2) total fat content of 30% kcal or less, (3) saturated fat content of 10% kcal or less, (4) at least 10 g protein, (5) at least 286 mg calcium, (6) at least 3.5 mg iron, (7) at least 224 retinol equivalent (RE) vitamin A, and (8) at least 15 mg of vitamin C.[16]

Percentages of Eat Smart guidelines met were not significantly different between experimental groups. For the 26 Eat Smart preparation guidelines, the mean percentage of guidelines met in all treatment groups was 81.9% and ranged from 75.6% in the unexposed schools to 84.0% in the former intervention schools (data not shown).

The numbers of schools that met the USDA SMI guidelines for selected nutrients (energy, total fat, saturated fat, protein, calcium, iron, vitamin A, and vitamin C) were not significantly different between experimental groups (Table 4). More than 90% of school cafeterias in all conditions met the USDA guidelines for protein, calcium, vitamin A, and vitamin C. The guidelines with lower compliance included total fat and saturated fat. In addition, only 66.7% of cafeterias from the unexposed schools met the USDA guideline for energy compared with 90% or more of the former CATCH intervention and control cafeterias, indicating that meals in a significant proportion of unexposed school cafeterias provided less than adequate energy intakes or underreported foods.

There were significant associations between cafeteria staff self-reported importance of encouraging children to eat a diet low in fat and low in sodium and the number of school cafeterias meeting the eight USDA guidelines (Table 5). Increased importance of encouraging children to eat a diet low in fat and low in sodium was associated with increased likelihood of the school meeting all eight USDA SMI guidelines ($p < .05$). The association between self-efficacy in preparing school foods low in fat and meeting the eight USDA guidelines approached significance ($p = .087$), but use of CATCH materials did not seem to affect guideline use.

DISCUSSION

Mean menu nutrient content of school lunches from former CATCH intervention schools most closely met the NSLP recommendations for fat and saturated fat, compared

Table 5. Relation of Schools Meeting Eight USDA Guidelines in Menus as Offered With Competing Programs and School Staff Questionnaire Data (N = 88)

	Met Eight USDA Guidelines[a]		
Questionnaire Item[b]	Odds Ratio	p value	95% CI
Number of competing programs (0 to 11)	1.07	0.640	(0.80, 1.43)
Self-efficacy for preparing foods low in fat (1 = *lowest* to 5 = *highest*)	2.44	.087	(0.88, 6.76)
Importance of encouraging children to eat a diet low in fat (1 = *lowest* to 5 = *highest*)	4.73	.033	(1.13, 19.7)
Self-efficacy for preparing foods low in sodium (1 = *lowest* to 5 = *highest*)	2.40	.095	(0.86, 6.71)
Importance of encouraging children to eat a diet low in sodium (1 = *lowest* to 5 = *highest*)	5.38	.010	(1.51, 19.2)
Plan to use CATCH materials in menu planning this school year (1 = no, 2 = yes)	0.001	.296	(<.001, 320)
Plan to use CATCH materials in food purchasing this school year (1 = no, 2 = yes)	0.51	.852	(<.001, 652)
Plan to use CATCH materials in food preparation this school year (1 = no, 2 = yes)	1.58	.560	(0.34, 7.37)

NOTE: p value and 95% confidence interval (CI) are from logistic regression, adjusted for CATCH site. USDA = U.S. Department of Agriculture; CATCH = Child and Adolescent Trial for Cardiovascular Health.

a. USDA guidelines included eight variables for nutrient guidelines for students in Grades K-6: (1) energy level of 664 kcal, (2) total fat content of 30% kcal or less; (3) saturated fat content of 10% kcal or less, (4) at least 10 g protein, (5) at least 286 mg calcium, (6) at least 3.5 mg iron, (7) at least 224 retinol equivalent (RE) vitamin A, and (8) at least 15 mg of vitamin C.[16]

b. Questionnaires were completed by school staff and averaged within each school.

to cafeterias from both former CATCH control schools and unexposed schools. Overall, schools from all treatment groups met the majority of USDA SMI guidelines in 1998-1999. Few significant differences between CATCH former intervention schools and unexposed schools were evident, except in variables that assess exposure to CATCH, such as attendance at CATCH training sessions and awareness of CATCH. However, there were significant differences between former CATCH intervention schools and control schools on several variables, notably the percentage energy from fat in school lunches.

Former CATCH control schools were offered the CATCH Eat Smart training sessions and materials after the completion of the main trial. However, training was limited to 1 day, so these schools did not have the complete 2½-year program. During the main trial in 1991-1994, former intervention cafeterias received frequent training and booster sessions. In addition, the main trial included ongoing hands-on training by trained Eat Smart staff throughout the intervention period. Because CATCH intervention and control schools were located within the same school districts, school food service administrators may have mistakenly thought that the single CATCH training session and CATCH materials in the control schools were enough to continue the program and to meet the SMI guidelines. These data seem to suggest that, in fact, a single session was not enough. The distribution of CATCH materials by themselves, without ongoing training and support,

had few effects on helping personnel in school cafeterias meet NSLP standards. On the other hand, personnel in the unexposed schools may have been using multiple approaches to achieve the SMI goals. The number of competing programs in the treatment groups verifies this interpretation—the former intervention school cafeterias had the greatest number of schools with competing programs to lower fat, followed by the unexposed schools and finally the former control schools.

The CATCH Eat Smart program targeted fat, saturated fat, and sodium, all of which are nutrients that are commonly found in greater amounts than recommended in school meals.[4,13] For example, in the recent SNDA-II, virtually all school lunches met guidelines for energy and other nutrients, but a significant number of school menus did not meet the recommendation for fat or saturated fat.[8] Foods that contribute the greatest amounts to fat and saturated fat content in school menus include the entrée[17,18] and miscellaneous items (e.g., condiments such as salad dressings, ketchup, and margarine that are not included in other categories).[18] Reduction of fat in the entrées, vegetables, milk, and desserts can also lead to significant reductions in the fat and saturated fat content of school lunches.[17] These fat reduction strategies are emphasized in the Eat Smart training, as well as other food service training initiatives to implement the NSLP standards.[19]

Attitudes about the importance of encouraging children to eat a diet low in fat or sodium were significantly associated with meeting all eight NSLP standards, regardless of treatment group. Thus, training sessions that target implementation of the USDA guidelines should include behaviorally based exercises that address changes in attitudes about the importance of encouraging children to eat a healthier diet among food service staff, as well as activities designed to increase self-efficacy about preparing food lower in fat and saturated fat. CATCH Eat Smart training sessions were behaviorally based and included activities such as presentation and discussion of recent data, techniques to increase student acceptance of school meals, and actually practicing recommended menu planning and food preparation techniques, as well as coordinating with nutrition education efforts in the classroom. Other school food service programs to reduce fat and saturated fat have used similar methods.[20,21]

Limitations of this study include self-report of data, the later (1995 onward) simultaneous national implementation of SMI in all school cafeterias, and the lack of power to detect differences in unexposed schools, because there were only 12 unexposed schools. Although most data for this study were self-reported, menu analyses did include more objective measures such as collection of actual recipes and menus, observation of cooks, and collection of food labels. The implementation of SMI may have made school food service staff reluctant to admit that certain guidelines were not being met, especially on questionnaires such as the Eat Smart Guidelines questionnaire. Implementation of the SMI mandate has led all school food service departments to strive to meet the fat and saturated fat guidelines as soon as possible, and so secular trends certainly influenced the outcome of this study. Finally, it may be that 12 unexposed schools did not offer sufficient power to detect significant differences between treatment groups. National data from SNDA-II[8] indicate that only 18% of elementary schools assessed in 1998-1999 meet the NSLP standard for percentage of energy from fat compared to the 83.3% reported in the current study. In addition, fewer of the menus from the unexposed schools met the USDA standards for energy than menus from schools in SNDA-II, suggesting that our unexposed sample may not be representative of elementary schools in general. In addition, another study[22] that assessed implementation of healthy food preparation practices based on U.S. Dietary Guidelines found that fewer schools met these guidelines than reported among the unexposed schools in our study.

Implications for Practice

The CATCH Eat Smart Program, when implemented fully as in the former intervention schools, assisted school cafeterias in meeting USDA SMI guidelines 5 years postimplementation. For implementation of USDA guidelines, continued training efforts and participation in programs to achieve NSLP standards are important. In addition, food service training sessions should use behaviorally based techniques to increase school food service attitudes about the importance of preparing foods that meet NSLP standards and encouraging children to eat a diet lower in fat. Newer technologies that facilitate implementation of training sessions and incorporate behavioral strategies, such as online courses and CD-ROM programs should be tested as possibilities to increase training efforts at the cafeteria level. Implementing a school food service program as part of a coordinated school health program that emphasizes the importance of healthy eating in the school environment[23,24] could be another method of increasing attitudes of the school food service personnel about the importance of encouraging children to adopt healthy dietary habits.

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