The Journal of Child Nutrition & Management
Volume 27, Issue 1, Spring 2003
Published by School Nutrition Association

Nutrient Quality of School Lunches in Indiana: Compared by School Enrollment and Menu Planners' Education Levels

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ABSTRACT

This study compares the nutrient quality of planned menus among schools grouped by school enrollment size and menu planners' education levels. This study was conducted in three phases: (1) questionnaire development and administration, (2) nutrient analysis of school lunch menus, and (3) comparison of nutrient quality among groups categorized by the school enrollment sizes and menu planners' education levels. In Phase I, menu planners in all 425 Indiana school corporations were surveyed. Following two mailings, the response rate was 61% (n= 251). About half of the respondents (n=124) indicated that they would provide the researchers with one week's menus and recipes. Eighteen school corporations were selected from this group, using stratified random sampling based on the school enrollment size and the menu planners' education levels. Two of these school corporations failed to send their menus and recipes.

The researchers used NutriKids®™ to analyze the nutrient content of one week of planned menus for each of the 16 participating school corporations. The menus exceeded the Recommended Dietary Allowance (RDA) for protein, calcium, iron, vitamin A, and vitamin C. The school lunches did not comply with the D*ietary Guidelines for Americans* (DGAs) goals for total fat and saturated fat when examined on average. The amount of sodium in the planned menus exceeded the National Research Council (NRC) recommendation, while cholesterol was within the NRC guidelines. The percentage of schools meeting the DGA goals for total fat was associated with school enrollment size ($p<0.05$), but not with menu planners' education levels. Lunch menus of medium school enrollment size (1,236-2,500) met the *DGA* goals for total fat.

Results did not support the hypothesis that the menu planners' education levels influence meeting nutrient standards of planned menus. Nevertheless, results illustrated the importance of providing workshops and training materials on menu planning and the U.S. Department of Agriculture (USDA) meal patterns. Without this training, foodservice professionals would not have the knowledge and skills needed to plan menus to meet USDA regulations and other nutritional guidelines. Results support the need for menu planners to learn about methods to limit total fat and saturated fat. For future studies, a larger sample size would be helpful in measuring the importance of menu planners' education levels.

INTRODUCTION

In 1997, more than 26.3 million children participated in the National School Lunch Program (NSLP) (U.S. Department of Agriculture [USDA], 2001c). While lunches offered in the NSLP normally provided one-third of the Recommended Dietary Allowances (RDA) (Food and Nutrition Board, 1989) for most nutrients, they often included excessive amounts of total fat, saturated fat, and sodium (Burghardt, Gordon, & Fraker, 1995). The School Nutrition Dietary

Assessment Study (SNDA-I) reported the nutrient content of school meals offered in School Year (SY) 1991-92. In SY 1991-92, school lunches on average met the National Research Council (NRC) recommendations for dietary cholesterol and, in general, met or exceeded the RDAs for vitamins and minerals (Burghardt et al., 1995). However, school lunches contained an estimated mean of 1,479 mg of sodium, an amount that is nearly twice the NRC recommendation (800 mg).

The School Nutrition Dietary Assessment Study (SNDA-II) revealed that elementary school meals in SY 1998-99 provided 33% of energy from total fat, with 12% from saturated fat (USDA, 2001b). The same study showed that the average lunch served in secondary schools provided about 35% of energy from total fat and 12% of energy from saturated fat. These data clearly indicated that school lunches have not kept pace with the current scientific knowledge about diet and that school lunches need to significantly reduce intake of total fat, saturated fat, and sodium. Improving the nutrient quality of school lunches has been consistent with the history and spirit of the NSLP (Frank, Vaden, & Martin, 1987; Gregoire, Sneed, & Martin, 1993).

In the past, strategies to improve the nutrient quality of school meals focused on a single issue such as the fat or sodium content of menu items and meals. However, an increasing number of studies have investigated the feasibility of implementing the *Dietary Guidelines for Americans* (DGAs) (USDA, 2001d) and the impact that this would have on menu planning, procurement, production, and service of school meals (Glover, Stitt, Kendrick, & Hayes, 1991; Hurd, Friedman, & Cise, 1996; Johnson, Johnson, Harvey-Berino, & Wang, 1994; Miller, Gould, Pearson, & Jensen, 1994). Hurd et al. (1996) reported a direct correlation between district size and compliance with DGA goals. They found that large school districts complied with the DGA goals more often than small districts enrolling fewer than 1,000 students. They presumed that school foodservice directors in large districts had better access to food products and greater economic and educational resources.

The nutrient content of the menus is an important factor in planning menus for school foodservice (Sneed & Gregoire, 1995). Sneed and White (1993) indicated that evaluating the nutrient quality of food items and menu planning were important competencies for program management. However, Williams et al. (1997) reported that most foodservice directors responsible for menu planning had only a high school education and were not registered dietitians. Hoover et al. (1998), on the other hand, reported that managers' education made no difference in the compliance of Texas school foodservice menus with USDA meal patterns, DGA goals, and the NRC recommendations.

Our review of literature revealed that previous research has not evaluated the influence of both school enrollment sizes and menu planners' education levels on the nutrient quality of planned menus. The specific objective of this study was to compare the nutrient quality of planned menus among schools grouped by school enrollment sizes and menu planners' education levels.

METHODOLOGY

Research Design
The research proceeded in three phases: (1) questionnaire development and administration, (2) nutrient analysis of school lunch menus, and (3) comparison of nutrient quality among groups categorized by school enrollment sizes and menu planners' education levels. Stratified random sampling was used in terms of school enrollment sizes (large, medium, and small) and menu planners' education levels (high school diploma or less and bachelor's degree or higher). Nutrient quality was defined in this study as the degree of compliance of lunch menus with nutrient standards for energy, protein, calcium, iron, vitamin A, vitamin C, sodium, cholesterol, percentage energy from total fat, and percentage energy from saturated fat. Nutrient standards were based on one-third of the RDA for energy, protein, calcium, iron, vitamin A, and vitamin C; DGA goals for percentage energy from total fat and percentage energy from saturated fat; and NRC recommendations for sodium and cholesterol.

Phase I. Questionnaire Development and Administration
Sample and Data Collection. The purpose of Phase I was to determine the sampling population for the stratified random sampling in Phase II. Researchers developed a questionnaire that was comprised of two sections. The first section requested information about the characteristics of the menu planners, including:

- Job title;
- Menu planners' education levels;
- Years worked in school foodservice;
- Years in present position;
- Certification status (no certification, ASFSA certification, registered dietitian, State Department of Education certification);
- Number of nutrition courses taken;
- Use of consultants in menu planning; and
- Attitude toward menu planning.

The second section requested information about the school corporations, including:

- Number of schools in the corporation;
- School corporation enrollment size;
- Average number of NSLP lunches served per day;
- Type of menu planning used; and
- Type of food production system.

Researchers asked menu planners' about their willingness to send one week's menus and recipes. The researchers pilot-tested the questionnaire using 22 menu planners who were not included in the study sample. The revised questionnaire, cover letter, and postage-paid return envelope were mailed in October 1999 to 425 Indiana school corporation directors, including public and private schools. The directors were asked to distribute the questionnaire to their menu planners or to complete it themselves if they assumed the role of menu planner. Non-respondents received follow-up postcards two weeks after the initial mailing to increase the response rate.

Phase II. Nutrient Analysis of School Lunch Menus

Sample and Data Collection. A total of 251 school corporations responded in Phase I (61%). These school corporations were used for the "Response Group." Only 124 school corporations in the "Response Group" indicated that they would send one week's menus and recipes for nutrient analysis, and they were used for the "Volunteer Group." Eighteen school corporations were selected from the "Volunteer Group," using stratified random sampling in terms of school enrollment size and menu planners' education level. School enrollment size was defined as large (>2,500; n=5), medium (1,236 - 2,500; n=5), and small (≤1,235; n=6). Menu planners' education levels were categorized as high school diploma or less (n=8) or bachelor's degree or higher (n=8).

Menu planners were asked to provide information on all foods planned as part of the NSLP meals during one week. Menu planners supplied menus, recipes for food items prepared in the school corporations, manufacturers' labels, nutrient analysis or product specifications of food items purchased from vendors, and details on food preparation procedures and portion sizes for all items. The researchers collected any missing information through telephone calls. Two school corporations in the volunteer group failed to send their menus and recipes.

Data Analysis. The nutrient content of the weekly menus and their corresponding recipes for 16 school corporations were analyzed using NutriKids for Windows (1.6.3) (LunchByte System, Inc., Rochester, NY). All nutrient analyses were made by one researcher to ensure consistency in the data analysis process. Ingredients not included in the NutriKids database but used by individual school corporations were entered manually. Researchers relied on corporation recipes or standard formulations in the NutriKids database and coded the nutrients in each food item on the basis of the information provided. The researchers averaged the 2 or 3 selective choices for entrees, fruit, and milk.

Once all the ingredients and the amounts of ingredients specified by the recipes included on the planned menus were entered, the NutriKids software program calculated the nutrient content for each menu item and produced a spreadsheet based on an average portion size of each menu item. The menu spreadsheet included a daily and a weekly average of specific nutrients and the percentage of those meeting the recommended standard. The standards used in the NutriKids software program are based on one-third of the RDA. The researchers entered the sodium and cholesterol guidelines from NRC recommendations. The fat content of planned menus was compared with the goals suggested by the DGA.

Phase III. Comparison of Nutrient Quality

Data Analysis. Based on results of the two phases, the researchers obtained the average amount of each nutrient among groups categorized by school enrollment sizes and menu planners' education levels. The average of the percentage meeting the standard for each school lunch menu also was calculated. Using the Statistical Analysis System (6.12, Cary, NC), researchers conducted two-way Analysis of Variance (ANOVA) to test differences in average percentage meeting the standard for each nutrient in each grouping in relation to school enrollment sizes and menu planners' education levels. A probability level of 0.05 was used for all tests of significance.

RESULTS AND DISCUSSION

Characteristics of the Menu Planners and School Corporations in the Response Group

Characteristics of the menu planners and their school corporations from the Response Group are presented in **Table 1**. The menu planners' education levels varied; 71 (57.3%) menu planners had a high school diploma or less, and 26 (20.9%) had a bachelor's degree or higher. More than half of the menu planners had some type of certification. These findings are consistent with results of previous research. Williams et al. (1997) reported that 63% of the menu planners in their study had a high school education. Gregoire and Sneed (1994) found that more managers had high school or less education (70.8%) than directors/supervisors (41.4%). They also found that 38.8% of directors/supervisors had college degrees, but only 7.4% of managers did.

Table 1. Characteristics of menu planners and school corporations in Indiana schools

Characteristics	n	%
Education Level (n=124)		
High school diploma or less	71	57.3
Associate's degree	11	8.9
Bachelor's degree	19	15.3
Graduate degree	7	5.6
Other [a]	16	12.9
Certification Status [b] (n=146)		
No certification	59	47.6
ASFSA's certification	42	33.9
Registered dietitian	15	12.1
State department of education certification	14	11.3
Other [d]	16	12.9
Years in School Foodservice (n=18)		
< 5 years	18	14.5
5 to 10 years	29	23.4
11 to 20 years	38	30.6
> 20 years	33	26.6
Number of Nutrition Courses Completed (n=124)		
0	35	28.2
1 to 3	31	25.0
> 3	35	44.4
Menu Planning Option (n=121)		
Traditional meal pattern	94	75.8
Enhanced food-based meal pattern	8	6.5
Nutrient standard	17	13.7
Assisted nutrient standard	2	1.6
School Corporation Enrollment (n=113)		
< 1,235 students	39	34.5
1,235 to 2,500 students	38	33.6
2,501 to 5,000 students	19	16.8
5,001 to 10,000 students	7	6.2
> 10,000 students	10	8.8

[a] Other includes 1 year college and culinary school

[b] Respondents could indicate more than one response, thus the total percent equals more than 100

[c] ASFSA refers to the American School Food Service Association

[d] Other includes Certified Dietary Manager (CDM), Food Management Professional (FMP), ServSafe(r), and School Foodservice & Nutrition Specialist (SFNS)

In this study, many menu planners (45.2%) held state or American School Food Service Association (ASFSA) certification; 12% were registered dietitians (RDs). Approximately 44% of the menu planners had completed more than three nutrition courses; however, 28.2 % had never taken a nutrition course. Few school corporations in this study used a consultant to assist with menu planning (4%). Most menu planners had responsibility for the entire school foodservice

operation (65.3%). Nearly 27% of the menu planners had worked for more than 20 years in school foodservice.

Most (82.3%) of the school foodservice operations planned menus using the Traditional Meal Pattern or Enhanced Food-Based Menu Planning system. The Nutrient Standard Menu Planning or Assisted Nutrient Standard Menu Planning systems were used in only 15.3% of the school corporations. School enrollment ranged from 70 to 41,800 students. Approximately 35% of the school corporations had fewer than 1,235 students.

Nutrient Content of School Lunch Menus

The nutrient content of school lunch menus as planned was analyzed using the information provided by 16 school foodservice menu planners. The menus as planned provided an average of 653 kilocalories of food energy and 28 grams of protein. The school lunches provided more than one-half of the RDA for protein, calcium, vitamin A, and vitamin C for each grade level. However, the average energy provided was less than the one-third of energy guidelines for the 6th-grade level.

The average amounts of total fat and saturated fat in the 16 planned menus exceeded the DGA goals. The average percentage of energy from total fat in 16 planned menus was 33%, compared with the DGA goals for ≤30%. The average percentage of energy from total fat was similar to that of the SNDA II Study (USDA, 2001b) findings. However, Rainville (2001) found that reimbursable school lunches were more likely to meet recommendations for ≤30% kcal from fat, protein, vitamin A, calcium, iron, and zinc in a study of the nutritional quality and food items in reimbursable school lunches compared to lunches brought from home in elementary schools. The average percentage of energy from saturated fat in Rainville's 2001 study was higher than that of the SNDA II Study (USDA, 2001b). The average percentage of energy from saturated fat in the planned menus was 15%, compared with the DGA goals for ≤10%. As shown in **Table 2**, lunch menus in 5 of 16 school corporations provided an average of ≤30% of food energy from fat. Only one school foodservice operation conformed to the DGA goals for saturated fat.

Table 2. Fat composition of school lunches as planned per each enrollment and education level

Dietary Component	Enrollment Size			Education Level	
	Small [b] (n=6)	Medium [c] (n=5)	Large [d] (n=5)	HSL [e] (n=8)	BDH [f] (n=8)
Food energy from fat (%)[a]					
≤ 30	1	3	1	1	4
31 to 35	0	2	2	3	1
36 to 40	5	0	1	3	3
> 40	0	0	1	1	0
Food energy from saturated fat (%)[a]					
< 10	0	1	0	0	1
10 to 12	1	3	2	3	3
13 to 15	3	0	2	3	2
16 to 18	1	0	0	0	1
> 18	1	1	1	2	1

[a]As a percentage of total energy

[b]Small enrollment size: ≤1,235

[c]Medium enrollment size: 1,236-2,500

[d]Large enrollment size: >2,500

[e]HSL means high school diploma or less education

[f]BDH means bachelor's degree or higher education

Sodium in the planned menus exceeded the NRC recommendations, although the average amount of cholesterol was within the recommended range. The average amount of sodium in planned menus was 1,105 mg, nearly 1.4 times the lunch target of 800 mg. The average amount of cholesterol in the planned menus was 69 mg, which was less than one-third of the maximum recommended intake of 300 mg per day.

Comparison of Nutrient Quality

Table 3 shows the average nutrients per each enrollment and education level. For each enrollment size and each menu planners' education level, protein, iron, calcium, vitamin A, and vitamin C exceeded the RDA, and sodium exceeded the NRC recommendations, while cholesterol met the NRC recommendations. Only one school lunch menu met the DGA goals for saturated fat and five school lunch menus met the DGA goals for total fat.

Printed from *The Journal of Child & Nutrition Management*, Issue 1, 2003
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Table 3. Average nutrients per each enrollment size and education level

	n	Energy (Kcal)	Protein (g)	Cholesterol (mg)	Sodium (mg)	Total Fat (%)[a]	Saturated Fat (%)[a]	Calcium (mg)	Vitamin A (mg)	Vitamin C (mg)	Iron (mg)
Education Level											
HSL [b]	8	667	28	69	1,036	34	16	464	387	28	4
BDH [c]	8	640	28	68	1,174	32	14	463	455	25	4
Enrollment Size											
Small [d]	6	633	27	73	1,044	36	17	455	400	26	4
Medium [e]	5	678	29	67	1,193	29	13	449	364	29	4
Large [f]	5	653	29	66	1,091	34	14	488	504	24	4

[a] *As a percentage of total energy*
[b] *HSL means high school diploma or less education*
[c] *BDH means bachelor's degree or higher education*
[d] *Small enrollment size: ≤1,235*
[e] *Medium enrollment size: 1,236-2,500*
[f] *Large enrollment size: >2,500*

The two-way ANOVA was conducted to test menu planners' education levels, school enrollment sizes, and to determine the interaction between these variables as they might influence menu planning and nutrient quality of school lunch menus. Menu planners' education levels and school enrollment sizes were used as predictors of the dependent variable-percentage of each nutrient standard met in school lunch menus. No differences were found among school enrollments in meeting nutrient standards for saturated fat, energy, cholesterol, sodium, iron, vitamin A, and vitamin C. None of the enrollment size groups or education levels met the DGA goals for saturated fat when examined on a group average. However, total fat and saturated fat were lower in school corporations where menu planners had a bachelor's degree or higher. No differences were found between menu planners' education levels in meeting nutrient standards for energy, cholesterol, sodium, iron, Vitamin A, and Vitamin C. Menu planners with bachelor's degree or higher provided less saturated fat (13.6%) than menu planners with a high school diploma or less.

However, we found a significant interaction between education/enrollment and the percentage of energy from total fat. As shown in **Table 4**, the percentage of energy from total fat was 26.5% in school lunch menus whose menu planners had a bachelor's degree or higher in the medium

enrollment school. Medium school enrollment size had a positive correlation with the percentage of energy from total fat for menu planners with a bachelor's degree or higher, but not for those with a high school diploma or less. Menu planners who had a bachelor's degree or higher in the medium enrollment school met the percentage of energy from total fat better than those who had a high school diploma or less in the medium enrollment school.

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Table 4. Average nutrients per each education-by-enrollment group level

Education Level	Enrollment Size	n	Energy (Kcal)	Protein (g)	Cholesterol (mg)	Sodium (mg)	Total Fat (%)[a]	Saturated Fat (%)[a]	Calcium (mg)	Vitamin A (mg)	Vitamin C (mg)
HSL [b]	Small [d]	3	616	27	68	984	34	18	480	380	29
	Medium [e]	2	774	30	73	1,073	32	16	427	235	30
	Large [f]	3	646	28	68	1,064	36	13	474	496	25
BDH [c]	Small [d]	3	651	27	77	1,104	38	15	430	419	23
	Medium [e]	3	613	28	63	1,273	27	10	464	450	28
	Large [f]	2	664	31	63	1,131	30	16	510	517	23

[a] *As a percentage of total energy*
[b] *HSL means high school diploma or less education*
[c] *BDH means bachelor's degree or higher education*
[d] *Small enrollment size: ≤1,235*
[e] *Medium enrollment size: 1,236-2,500*
[f] *Large enrollment size: >2,500*

CONCLUSIONS AND APPLICATIONS

The ANOVA results showed that menu planners' education levels did not affect the level of most nutrients, including saturated fat, energy, protein, cholesterol, sodium, iron, calcium, vitamin A, and vitamin C. Despite average levels of total fat and saturated fat being lower in menus planned by an individual with a bachelor's degree compared to a high school diploma, the results of this study did not demonstrate that the menus are superior for any other nutrient. Indeed, results support that menu planners need to learn about methods to limit total fat and saturated fat.

One possible conclusion could be that most menu planners, regardless of their educational background, follow the state and federal regulations that require them to meet the USDA meal patterns for meal reimbursement. When following the USDA meal patterns, menu planners are likely to meet nutrient requirements. Additionally, extensive school foodservice experience and continuous job training in workshops may help to improve the nutrient quality of school lunch menus. Without this training, foodservice professionals may not have the knowledge and skills needed to plan menus to meet USDA regulations and other nutritional guidelines.

There were several limitations to this study. This research focused on the average nutrients in planned menus. This assumes that each food on the menu would have been available to each

student. The foods and nutrients that students actually consumed would differ from the foods planned because students in many schools were able to choose their meals from among a number of alternative foods or may not consume all of the food they were served.

The major limitation of this study was the small sample size in conducting two-way ANOVA to examine the relationship between the nutrient quality and the menu planners' education levels and school enrollment sizes. The small number of sample school menus limits the ability to generalize the findings. Additional research with a larger sample could be conducted to help confirm results of this study.

The scope of this study also was limited by an inconsistency of information provided by each school. While many school corporations provided well-prepared information for coding their menus, a few did not provide their recipes or the nutrition labels of vendor products. Thus, the nutrient analyses of these menus were based on written documents without direct observations. Use of a computerized nutrient analysis program is another limitation due to use of average nutrient data for some foods. This may have resulted in an underestimation of sample nutrient values. (The combination of direct observations and written documents can provide data for an in-depth comparison, although this is a time-consuming and labor-intensive project.)

Moreover, the primary unit of analysis was menus planned for only a one-week period of time. This time frame reflected the USDA requirements for nutrient evaluation, but most schools follow a multi-week menu planning cycle. When researchers requested the menus, a particular week was not specified, and several schools had a special National School Lunch Week menu designated during the month menus were reported. The menu planners sent one-month menus, and the researchers selected one week for nutrient analysis. Therefore, the one-week period selected for this study may not be truly representative of the food planned on average.

Schools incorporated the guidelines into menu planning by following the established USDA meal patterns, regardless of the menu planners' education levels. Thus, results of this study suggest that using guidelines provided by the USDA (USDA, 2001a) can have a major impact on the nutrient quality of the school lunch menus.

ACKNOWLEDGEMENTS

The Child Nutrition Foundation provided financial support for this research through the Hubert Humphrey Research Grant. The authors wish to thank Dr. Barbara Almanza, the Indiana State Department of Education, and the school foodservice directors in the 16 school districts who participated in this study.

REFERENCES

Burghardt, J.A., Gordon, A.R., & Fraker, T.M. (1995). Meals offered in the National School Lunch Program and the School Breakfast Program. *American Journal of Clinical Nutrition, 61* (Suppl.), 187s-198s.

Food and Nutrition Board. (1989). Recommended Dietary Allowances (10th ed.) Washington, DC: National Academy Press.

Frank, G.C., Vaden, A.G., & Martin, J. (1987). School health promotion: Child nutrition programs. *Journal of School Health, 57,* 451-469.

Glover, P.K., Stitt, K.R., Kendrick, O.W., & Hayes, J.S. (1991). Dietary Guidelines: Knowledge of and use by dietary managers. *School Food Service Research Review, 15*(2), 111-113.

Gregoire, M.B., & Sneed, J. (1994). Continuing education of district school nutrition directors/supervisors. *School Food Service Research Review, 18*(1), 16-22.

Gregoire, M.B., Sneed, J., & Martin, J.M. (1993). School foodservice: A look to the future. *Hospitality Research Journal, 17*(1), 175-191.

Hoover, L.C., Martin, R.E., Fox, E.A., Lan, W.R., & Ahmad, M. (1998). Analysis of Texas school foodservice menus to determine compliance with nutrition standards. *The Journal of Child Nutrition & Management, 22*(1), 15-31.

Hurd, S.L., Friedman, B.J., & Cise, N. (1996). Evaluation and implementation of the U.S. Dietary Guidelines into the child nutrition programs in Texas. *Journal of the American Dietetic Association, 96*, 904-906.

Johnson, R.K., Johnson, D.G., Harvey-Berino, J., & Wang, M.Q. (1994). Diet quality of the noontime meal among a large sample of U.S. adolescents. *School Food Service Research Review, 18*(1), 2-7.

Miller, D., Gould, R., Pearson, J., & Jensen, J.B. (1994). Status of dietary guideline use in Utah schools. *School Food Service Research Review, 18*(1), 23-28.

National Research Council. (1989). Diet and Health: Implications for reducing chronic disease risk. Report of the Committee on Diet and Health, Food and Nutrition Board, Commission on Life Sciences. Washington, DC: National Academy Press.

Rainville, A.J. (2001). Nutritional quality of reimbursable school lunches compared to lunches brought from home in elementary schools in two southeastern Michigan districts. *The Journal of Child Nutrition & Management, 25*(1), 13-18.

Sneed, J., & Gregoire, M.B. (1995). Nutrition in child nutrition programs: Implications for recipe and menu development. *Journal of Nutrition in Recipe and Menu Development, 1*(3), 15-25.

Sneed, J., & White, K.T. (1993). Continuing education needs of school-level managers in child nutrition programs. *School Food Service Research Review, 17*(2), 103-108.

U.S. Department of Agriculture, Food and Nutrition Service (2001a). 7CFR Parts 210 and 220, National School Lunch Program and School Breakfast Program: School Meals Initiative for Healthy Children; Final Regulation. *Federal Register*, July 24, 2001, 66(142), 38349-38350.

U.S. Department of Agriculture, Food and Nutrition Service (2001b). School Nutrition Dietary Assessment Study II: Summary of Findings. Retrieved June, 18, 2001.http://www.fns.usda.gov/oane/menu/published/cnp/files/sndaiifindsum.htm

U.S. Department of Agriculture, Food and Nutrition Service (2001c). Child Nutrition Programs: School Lunch Program-Fact Sheets: Retrieved July, 18, 2001.http://www.fns.usda.gov/cnd/Lunch/AboutLunch/faqs.htm

U.S. Department of Agriculture, U.S. Department of Health and Human Services (2001d). *Nutrition and Your Health: Dietary Guidelines for Americans* (5th ed.) (Home and Garden Bulletin No. 232) Washington, DC: U.S. Government Printing Office.

Williams, D.L., Gregoire, M.B., Canter, D.D., & Shanklin, C.W. (1997). Menu planning in elementary schools. *School Food Service Research Review, 21*(1), 46-50.

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