

Prevalence of Food Production Systems in School Foodservice



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Abstract

Prevalence studies of production systems in health care foodservice settings have been reported; however, similar information describing school foodservice operations is limited. A nationwide telephone survey using a stratified random sample of school districts was conducted to identify the prevalence of various production systems used in local school districts. The survey was designed to require no more than five minutes of respondents' time using a computer assisted telephone survey system. Data were collected and descriptive statistics determined using SPSS Version 11.5. From a sample of 540 school district contacts, 353 (65.3%) responded to the survey, representing schools in 49 of 50 states. The sample reflected enrollments ranging from less than 2,500 to more than 10,000 students and included free and reduced price categories ranging from 0-100%. The most frequently reported production system was onsite kitchens (45.3%). The second most frequently reported system was a combination production system (40.5%) where a central kitchen delivered to a number of satellite locations in addition to schools with onsite food preparation. Central kitchens without additional onsite kitchens represented 14.2% of this study. Of those school districts using either central kitchens or combination productions systems, 78% reported hot food preparation using hot food delivery to satellites. Cook-freeze or cook-chill production systems were reported by 22% of respondents. The high proportion of school districts that prepared and delivered foods hot to satellite sites supports continuing efforts to identify food safety practices and issues related to maintaining food quality in schools.

Prevalence of Food Production Systems in School Foodservice

Introduction

All managers are expected to improve efficiency, productivity, and effectiveness of operations. In tight economic periods with budget reductions, school foodservice directors have increased responsibility in developing, implementing, and monitoring production systems to maximize efficiency while minimizing costs. In the health care industry, similar challenges and pressures were experienced in the 1980s when reimbursement policies changed and revenue sources became limited. The rise in popularity of centralized production that incorporated cook-chill or cook-freeze systems reflected the interest to reduce labor costs and control quality in an industry where 60% or more of total costs could be devoted to labor (Greathouse & Gregoire, 1988; Nettles & Gregoire, 1993; Nettles, Gregoire, & Canter, 1997; Nettles, 1997; Brown & Hoover, 1991). School foodservice systems are no less labor intensive than health care settings. In fact, school foodservice systems frequently have multiple operating sites, multiple inventories, and additional transportation requirements that contribute to high labor requirements. Labor costs as a percentage of the operating budget were suggested by Martin and Conklin (1999) to represent 40% of the total operating budget in contrast to the 60% or higher proportion of operating budgets in health care settings. This difference is reflected in the different service hours and number of meals served. Health care foodservice typically operates in the range of 15-24 hours per day, 7 days a week. In

contrast, school foodservice settings serve one to two meals on a Monday-Friday schedule during the school year. However, meals served at school have been expanded across the school day to include afterschool snacks, supper meals, and summer feeding programs in many locations. This trend for more meals served at school is only expected to increase.

Pressures to manage labor costs will continue and likely increase in the near term. Centralizing food production systems is a commonly accepted concept for reducing labor costs. Separating the production and service components of foodservice systems permits several adjustments in the labor pool. First, the peaks and valleys in effective use of available labor hours commonly associated with onsite preparation and service of meals can be managed (Sobelman, 1986). More highly skilled labor is required for food preparation in cook-chill or cook-freeze settings. Typically, larger quantities of food are prepared that permit the operation to benefit from economies of scale through use of larger equipment and more efficient use of that equipment. The satellite finishing and onsite service to the final customer requires less technical food production skills; therefore, less skilled individuals may be hired at a lower wage to finish and serve the meals. Such a division of tasks is believed to maximize the efficiency of the available labor pool. In addition to efficiencies obtained through centralized production, proponents of these systems suggest that quality and standardization of food production improves with centralization. Cost savings associated with recipe standardization is well documented. Not only is food quality improved but a consistent quality nutritional profile in the prepared foods may also be achieved.

Attainment of labor cost savings and improved food quality and nutrient content through centralization can be offset by new or increased costs associated with centralized production and distribution. Delivery and service of centrally prepared food may be accomplished through several methods. Centrally prepared foods may be packaged either in bulk or individually and transported hot for immediate service the day items are prepared. Heat maintenance equipment and transportation equipment are required for the delivery phase. Alternatively, centrally prepared food packaged individually or in bulk can be chilled (cook-chill) or frozen (cook-freeze). The chilled or frozen food is typically kept in an intermediate inventory for distribution to satellite sites at a later time. Prepared foods may remain in intermediate inventory for hours, days, or weeks. Food production is scheduled to support pre-determined inventory levels. Management of the intermediate inventory may be centralized or decentralized at individual satellite service sites (Unklesbay, 1977). Use of this intermediate inventory introduces new cost management requirements not present in the cook and serve today (conventional) foodservice system. Refrigerated or frozen storage space is required as well as inventory control systems to ensure food safety and appropriate accountability of these intermediate products. Chilled or frozen foods require transportation to satellite locations not unlike transportation of hot food, and specialized equipment to hold foods at safe cold temperatures is required in addition to transportation equipment.

Service of foods from the intermediate cold storage inventory requires reheating prior to service to the final customer. For some specific menu items, additional labor may be needed to finish the food preparation beyond a simple reheating process. Reheating at a minimum requires access to reheating equipment on site. Because the food preparation

steps are minimized using the production system, employees with fewer food production skills are required to complete final food preparation and service. Since a full range of food equipment is not required for these few finishing steps, both the amount of food preparation equipment and total space required for finishing and service is reduced. The time to finish and serve foods to the final customer is also reduced, so fewer labor hours are required, which also results in labor cost savings for hourly employed staff. Labor costs may be redistributed and in some cases the number of employees may be reduced, but the promise of significant labor cost savings was not widely reported in either the health care foodservice or school foodservice literature. Greathouse, Gregiore, Spears, Richards, and Nassar (1989) reported in hospitals of 300 beds or more that there were no differences in labor hours among conventional (n=33), cook-chill (n=22), or cook-freeze (n=11) food production systems.

Food quality and food safety are important considerations in both cook-and-serve (conventional) as well as the cook-chill/freeze production systems. Since the cook-chill/freeze production system introduces additional holding and handling of cooked food, there are additional opportunities to impact on both the safety and quality of the final item. Food quality with respect to reheating cook-chilled/frozen items has been reported by numerous authors (Unkelsbay & Unkelsbay, 1978; Rollin, Matthews, & Lund, 1979; Church & Parsons, 2000; Dahl & Matthews 1979, 1980; Dahl, Matthews, & Lund, 1981). Appropriate use of reheating equipment, standardization of the reheating process, and employee training were identified as key factors in achieving appropriate food quality and customer acceptability of food items. Compliance with appropriate food

handling processes during storage in combination with following reheating guidelines directly impact on food safety and nutrient quality.

Williams (1996) and McErlain, Marson, Ainsworth, and Burnett (2001) reported vitamin losses, especially of water-soluble and heat sensitive vitamins. In both studies, loss of vitamin C was significant. Both the process of chilling and reheating and as the total time food was held hot prior to service were identified as factors contributing to the vitamin loss. Food safety as evaluated by the extent of microbial contamination was assessed by Rini, Cremer, and Chipley (1981) and Sawyer and Pestka (1985). As would be expected, multiple handling processes result in additional opportunities to introduce new contamination as well as increase existing microbial growth during the chilling and reheating processes. Neither study reported a significant increase in microbial contamination when rapid chilling, proper storage, and rapid reheating to an appropriate temperature were achieved. Sawyer and Pestka suggested that inadequate chilling was the most important factor related to foodborne illness outbreaks reported between 1961 and 1976.

Little research is reported detailing the issues and efficacy of centralized food production and decentralized delivery systems in school nutrition programs. The *School Foodservice and Nutrition Compensation Study 2001* (American School Food Service Association (ASFSA), 2002) identified the distribution of food production systems as descriptive measures in a broader survey of compensation issues in school foodservice settings. One thousand three hundred ninety-one surveys (30.1% response rate) were analyzed. Approximately one-half of respondents (50.9%) reported using site-based kitchens, 14.3% reported using central kitchens, 33.6% reported using both, and 1.2% did

not respond. No definition of central kitchens was provided in either the report or indicated on the survey instrument. Since the purpose of the survey was to address compensation issues, no additional questions to characterize specific features of these production systems were included.

Two studies specifically evaluating cook-chill technologies in school foodservice were identified. Green (1997) evaluated the impact of cook-chill technology on employee satisfaction and employee perception of food quality in a North Carolina school district. Eighty-eight employees responded to surveys to assess satisfaction with specific job tasks and food quality of nine entrée choices. Employees liked the cook-chill production system (98% agreement). Eight of the nine products evaluated were rated either “good” or “very good” on a quality scale. Employees recognized that food quality was dependent on testing, development, and adaptation of recipes.

Kim and Shanklin (1999) evaluated plate waste and student perception of food quality in a cook-chill system in a midwest school district one year following a change from onsite to centralized cook-chill food preparation. Only one entrée item, spaghetti and meat sauce, was evaluated in this study. A statistically higher percentage of plate waste was observed for conventionally prepared spaghetti and meat sauce as compared to cook-chill preparation. Serving sizes were somewhat larger using the cook-chill production system and more consistent across schools as compared to the onsite preparation method. Students found the food quality of the cook-chill production method acceptable but did note that the spaghetti was more likely to be overcooked and broken into smaller pieces with the cook-chill production method. Focus group responses indicated that students perceived the cook-chill prepared spaghetti and meat sauce was

more likely to be too cold. The difficulties noted in this study were attributed to proper time and temperature control during delivery and handling processes. The conclusions of Kim and Shanklin were consistent with difficulties noted in other applications of cook-chill systems.

Labor management in school foodservice settings presents multiple challenges. Not only is there economic pressure to keep labor costs as low as possible, the tight labor market is projected to get tighter (Cetron & Davies, 2003). Efficiency in the preparation and delivery of high quality, nutritious food that students will accept is more important today than ever.

Single production systems that can be classified into conventional, central kitchen, commissary style, assemble and serve, cook-chill, or cook-freeze are likely to continue to evolve into combination systems that meet specific local or regional needs. Blended systems similar to the one reported by Riell (2002) will capitalize on the latest technology to improve efficient food delivery to schoolchildren each day. The purpose of this study was to evaluate additional characteristics in school foodservice production systems. Capturing additional descriptive information about central kitchens and combination systems in particular is necessary to identify training and planning needs for the National Food Service Management Institute (NFSMI) in particular as well as the broader school foodservice industry. Identification of the specific needs for training in equipment selection, layout, and kitchen design to meet the changing needs of the school foodservice environment is needed. A secondary purpose of this study was to explore the utility of telephone survey methodology as either a substitute or complement to mailed survey methods.

Methodology

A descriptive study was conducted to identify the prevalence of the various types of food production systems in school districts that employ either a central kitchen or a combination of central and site-based productions systems. Several questions addressed additional requirements for prepared food inventories, transportation methods, and methods used to reheat food. The survey included questions about the number of satellites served, transportation equipment, reheating equipment, and additional onsite food preparation. A random sample of 540 school food authorities was identified from a directory listing of school foodservice directors purchased from Information Central, Prescott, Arizona. The directory included basic demographic data concerning the school district; name, telephone number, and address. The full directory data set was analyzed to identify the distribution of production types (site-based kitchen, central kitchen, both, or other) within the sampling frame. The contacts data file included a category, "Cook/Chill," that was used to reduce the total sampling frame from 7,000 entries to approximately 1,400 entries. Reducing the sampling frame to districts that indicated a cook/chill system increased the probability that the school districts contacted would be using either a central kitchen or combination of onsite and central kitchens. A random stratified sample of 540 district directors was selected from the 1,400 possible school districts. The sample included representation from all 50 states.

A telephone survey was developed by the Center for Applied Research and Evaluation (CARE) located at The University of Southern Mississippi. The survey was designed to require no more than 5 minutes of interaction between a caller and school district director. A 10-station Computer Assisted Telephone Interviewing (CATI) system

using Sawtooth Ci3 WinCATI software was used for calling and data collection. Data files were prepared in SPSS 11.5 (September 6, 2002) and descriptive statistics were determined. The project was approved by the Institutional Review Board of The University of Southern Mississippi. A pilot test of the survey tool was conducted in August 2002 using a random sample of 30 school district foodservice directors. Pilot test data were not included in final data analysis. After minor revision of the survey instrument (Appendix A), student callers were trained by the Project Coordinator of CARE the first week of September 2003. An informational letter (Appendix B) was mailed August 30, 2003, to all of the randomly selected participants alerting them to the approximate dates that telephone calls would be made and requesting them to participate in the survey when called. Calls to school district directors were initiated the end of the second week of September 2003 and completed by September 30, 2003. Initially a 4-week calling period was identified; however, 353 (65% response rate) surveys were completed and the data collection period was terminated early. All data were evaluated for frequencies, mean, and standard deviation using SPSS Version 11.5.

Results and Discussion

The CATI system used by CARE tracks the disposition of all calls and has features that permit return calls for occasions where there was no answer, busy signals, or by request of the respondent. Actual disposition of all calls is reported in Table 1. Only 19 individuals (3.5% of 540 contacts) refused to participate in the survey process. This small number of refusals confirmed an assumption that School Food Authority (SFA) staff would be willing to answer a short telephone survey conducted during regular business hours. The original sample (n=540) included districts from all 50 states. The responses represented 49 of 50 states with only school districts in Hawaii not represented (Appendix C).

Table 1

Disposition of Phone Calls

Disposition	Number
Complete	353
Refusals	19
Fax/Data Line	3
Disconnected	43
No Answer	19
Answering Machine	31
Callback	47
Busy	8
Changed Number	10
Cell Phone	2
Other Business Phone Number	5
Total phone numbers	540

Survey respondents were asked a number of demographic questions to capture specific characteristics of the school district. Table 2 identifies the titles most frequently reported grouped by the following categories: Clerical/Administrative, Director, Manager, Supervisor, and Other.

Table 2

Job Titles of Survey Respondents

Job Category/Title	Number of Responses	Percent of Total N=353*
Clerical/Administrative	26	7
Director	218	62
Manager	38	11
Supervisor	32	9
Other		
Chief of Operations, Deputy Superintendent, or Regional Director	4	1
Coordinator or Foodservice Administrator	15	4
Specialist	20	6
Total	353	100

* All calculations rounded to the nearest full percentage point.

A number of questions were included to describe school district characteristics. These characteristics included number of elementary, middle/junior high schools, and high schools in the school districts. In addition to the number of schools in the districts, respondents were asked to identify if the campuses were open, closed, or both. The average enrollment was requested grouped by category: less than 2,500; 2,501-5,000; 5,001-10,000; and greater than 10,000. Respondents were asked to identify the percentage of free meals and reduced price meals. If respondents were unable to provide percentages by these two categories, they were asked the percentage of free and reduced price meals combined. Respondents were asked to identify the meal services provided in the district including breakfast, lunch, afterschool snacks, supper, and summer feeding programs.

The number of elementary, middle/junior high schools, and high schools in each district are reported in Tables 3-6. The mean number of schools per district was 8.13 elementary schools, 2.02 middle/junior high schools, and 2.63 high schools. The range for elementary schools was the largest (0-200). The range for both middle/junior high schools (0-25) and high schools (0-22) was much smaller than for elementary schools.

Table 3

Mean Number of Schools per District

	Mean N=353	Standard Deviation	Minimum	Maximum
Elementary Schools	8.13	14.59	0	200
Middle/Junior High Schools	2.02	2.54	0	25
High Schools	2.63	3.00	0	22

In Tables 4 through 6, the frequency distribution of schools by category is presented. Sixty-one percent of the districts (217 of 353) had one to five elementary schools. An additional 22% (77) of school districts had 6 to 10 elementary schools.

Table 4

Frequency and Percentage of Elementary Schools per District

Number of Schools	Frequency	
	N=353	Percent*
None	4	1
1-5	217	61
6-10	77	22
11-20	27	8
21-50	22	6
Over 50	6	2

* All calculations rounded to the nearest full percentage point.

The frequency distribution of middle/junior high schools (Table 5) shows that one to three middle/junior high schools are present in the majority of school districts (82.7%). One middle/junior high school was present in 43.4 (157) of school districts followed by two middle/junior high schools (22.4%, n=79), and three schools in 17% (n=60) of the school districts participating in the survey.

Table 5

Frequency and Percentage of Middle/Junior High Schools per District

Number of Schools	Frequency	
	N=353	Percent N=353*
None	7	2
1	153	43
2	79	22
3	60	17
4	12	3
5	10	3
More than 5	32	9

* All calculations rounded to the nearest full percentage point. Totals less than 100 percent reflect rounding.

The frequency of high schools per school district was similar to that of middle/junior high schools (Table 6) where 83.6% of the districts reported one to three high schools. Over one-half of the districts in the survey had one high school (57.2%, n=202) followed by two high schools (19.3%, n=68), and three high schools (7.1%, n=25).

Table 6

Frequency and Percentage of High Schools per District

Number of Schools	Frequency	
	N=353	Percent*
None	15	4
1	202	57
2	68	19
3	25	7
4	13	4
5	9	3
6	6	2
7	3	1
8	6	2
More than 8	6	2

* All calculations rounded to the nearest full percentage point. Totals greater than 100 percent reflect rounding.

The survey respondents reported that for both elementary and middle/junior high schools that over 92% of the campuses were closed where students were required to remain on school property during meal periods. High schools reported slightly more than one-half (57.5%) were closed campuses, 23.2% were open campuses, and the remaining 15% were a combination of open and closed campuses.

Table 7

Frequency of Open, Closed, or Combination Campus

School Type	No Response*	Open Campus	Closed Campus	Both Open and Closed Campus
Elementary	4 (1)	18 (5)	337 (93)	4 (1)
Middle/Junior High	7 (2)	12 (4)	325 (92)	9 (3)
High	15 (4)	82 (23)	203 (58)	53 (15)

*Percentages indicated in parentheses, percentages were rounded to the nearest full percent. A total of 353 responses in each group were categorized, overall N=353.

Survey respondents were asked to characterize the enrollment of their school district by the following four categories: Less than 2,500; 2,501-5,000; 5,001-10,000; and greater than 10,000 (Table 8). Over 66% of the respondents represented districts with 5,000 students or less.

Table 8

Enrollment of School Districts by Category

Category	Frequency	
	N=353	Percent*
Less than 2,500 students	96	27
2,501 to 5,000 students	138	39
5,001 to 10,000 students	61	17
Greater than 10,000 students	58	16

* All calculations rounded to the nearest full percentage point.

Survey respondents were asked the percentage of free and reduced price meals served within the district. Individual percentages for free and reduced price meals were requested; however, if a respondent was unable to provide separate percentages, the combined percentage of free and reduced price meals was captured. The range of responses for free meals was 0-100% free (N=280, 73 respondents unable to provide a separate free percentage). The range for reduced price meals was 0-92% (N=280, 73 respondents unable to provide a separate reduced price percentage). For the 73

respondents who were unable to provide individual percentages for free and reduced price meals, 50 provided a combined percentage that ranged from 3-83%, and 22 respondents were unable to provide any percentages. The free and reduced price percentages were mathematically combined for the 280 respondents who reported separate values, and combined values over 100% were eliminated. Table 9 presents the frequency distribution of the combined free and reduced price meals data. The minimum value was 1% and the maximum value was 100%. The frequency and percentage of districts reporting 0-25%, 26-50%, 51-75%, and 76-100% free and reduced price meals are reported in Table 9. The majority of districts (60.6%) served 26-75% free and reduced price meals.

Table 9

Frequency and Percentage of Free and Reduced Price Meals by District

Category	Frequency	
	N=322*	Percent**
0-25%	62	19
26-50%	90	28
51-75%	105	33
76-100%	65	20

*22 respondents did not answer this question, and 9 responses were eliminated for combined totals greater than 100%.

** All calculations rounded to the nearest full percentage point.

Survey respondents were asked to identify the meal services provided within the district. Possible responses included breakfast, lunch, afterschool snacks, supper, and summer feeding programs. A total of 353 responses were recorded for each of the meal service choices. Breakfast was provided in 87.3% (308) of the districts included in the survey. Lunch was provided in 99.4% (351) of school districts in the survey. Afterschool snacks were provided in only 36.5% (129) of the schools districts included in the survey, and 35.7% (126) of the school districts provided summer feeding programs. The least

frequent meal offered was supper, with only 2.5% (9) school districts reporting supper meal service.

Table 10

Meal Services Offered by District

Meal Service	Offered*		Not Offered	
	Number	Percent**	Number	Percent
Breakfast	308	87	45	13
Lunch	351	99	2	1
Afterschool snacks	129	37	224	64
Supper	9	6	344	98
Summer feeding programs	126	36	227	64

* N=353 for each meal service choice.

** All calculations rounded to the nearest full percentage point.

The sample for this study was specifically selected to obtain a high percentage of respondents that used central kitchens or a combination of central and onsite kitchens. A Microsoft Access (2002) database was manipulated to generate a random sample. The directory of over 7,000 school districts was sorted to identify the subset of school districts that had indicated any response to a designation labeled “Cook/Chill” other than a “no.” The data sort resulted in a possible sampling frame of 1,400 school district contacts in all 50 states. The survey sample of 540 was drawn from the 1,400 school districts. Survey respondents were asked to classify the production systems in the school district as onsite kitchens, central kitchen, or combination of onsite and central kitchens. Onsite kitchens were reported by 45.3% (160) of the respondents, central kitchens were reported by 14.2% (50) of respondents, and a combination of onsite and central kitchens was reported by 40.5% (143) of respondents. Overall, the survey sample reflected 54.7% (193) school districts using either a central kitchen or a combination of central and onsite kitchens. This compares favorably with the distribution of productions systems reported by ASFSA

(2001) where 14.3% of those survey respondents reported central kitchens and 33.6% reported combination kitchens.

In the current study, respondents who indicated onsite kitchens were asked if they delivered meals to facilities other than schools, an indication that the school district was functioning somewhat like a central kitchen. Of the 160 respondents who indicated they had only onsite kitchens for meal service, 34 school districts responded that they provided meals to facilities other than schools. The most frequently reported delivery site was a daycare center or early childhood center (23 of 34, 67.6%). Other facilities included nursing homes, local colleges, girls' center, special school, mental health facility, or military base.

Fifty survey respondents indicated that central kitchens were used in the school district. When asked how many delivery sites are serviced from the central kitchen, 21 school districts (42%) provided service to 1-5 sites, 18 (36%) school districts provided service to 6-10 sites, 6 school districts provided service to 11-20 sites, and the remaining 5 school districts provided service to 21 or more sites with 80 delivery sites the highest number of delivery sites reported. These 50 respondents were asked to identify the frequency of food delivery. Forty-nine of the 50 school districts indicated daily delivery with only one school district reporting a weekly delivery schedule. Thirty-nine of the 50 respondents used a hot food delivery system while nine school districts reported using a cook-chill system and two districts reported using a cook-freeze system. Maintaining the temperature of food is necessary for both food safety as well as food quality. The 39 respondents who used hot food delivery were asked the method of food transport. Basic trucks (20 responses) were identified most frequently followed by heated trucks or carts

(8 responses), insulated trucks or carts (5 responses), vans (4 responses), and refrigerated trucks (2 responses). Additionally, respondents were asked what method was used to keep foods hot. Heated food carts, cabinets, or warming units were used to maintain temperature by 25 respondents; the remaining 14 respondents reported using insulated carts or carriers to maintain food temperature.

Eighty-two percent of those individuals using a central kitchen and hot food delivery (n=39) reported that equipment was available on site to heat or reheat the food as necessary. Ovens (15), convection ovens (12), microwave ovens (6), and steamers and/or steam tables (5) were mentioned. Multiple answers to this question were permitted.

The 11 survey respondents that reported a central kitchen with either a cook-chill or cook-freeze production were asked to characterize the type of prepared foods inventory used. Only one respondent reported an onsite inventory system, seven reported central warehouse inventories, and three respondents reported using both onsite inventories and central warehouse inventories. Foods were delivered to schools from either the central kitchen or central warehouse using a basic truck (4), heated truck (3), refrigerated truck or insulated and refrigerated truck (2), or insulated truck (1). When asked how foods were reheated, these 11 respondents indicated convection ovens (5); ovens (3); ovens, microwave ovens, or thermal units (2); or heated carts (1). Additional onsite food preparation was reported by 6 of the 11 respondents. Baking foods, specifically French fried potatoes, was mentioned by all six of these respondents. Preparation of salad and burritos was mentioned in two cases. Two of the 11 respondents indicated they also delivered food to a junior college daycare site and a private school.

The third classification of production system, combination of onsite and central kitchen preparation, was reported by 139 (39.3%) of survey respondents. When asked how many onsite kitchens are used within the district, responses ranged from 1-130 kitchen sites. As shown in Table 11, 86 (62.9%) survey respondents reported four or less onsite kitchens in addition to a central kitchen operation.

Table 11

Frequency Distribution of Onsite Kitchens for Districts Reporting Combination Production Systems

Number of Onsite Kitchens	Frequency	
	N=139	Percent*
1	10	7
2	29	21
3	26	19
4	21	15
5	11	8
6	11	8
7	7	5
8	8	6
More than 8 (range = 9-130)	16	12

* All calculations rounded to the nearest full percentage point. Totals over 100 percent are due to rounding.

The frequency of delivery sites that are supported by the central kitchen ranged from 1–200 sites. As shown in Table 12, four or less satellite sites were reported by 91 (66.4%) respondents.

Table 12

Frequency Distribution of the Number of Satellite Delivery Sites Supported by Central Kitchens in Combination Production Systems

Number of Satellite Sites Supported	Frequency	
	N=137*	Percent**
1	27	20
2	25	18
3	20	15
4	19	14
5	11	8
6 -8	12	9
9-12	10	7
12-48	12	9
200	1	1

* Two respondents indicated 0 satellite sites; therefore, those data were eliminated.

** All calculations rounded to the nearest full percentage point. Totals greater than 100 reflect rounding.

When asked about the need to reheat food at the satellite sites, 90.9% (130) responded that equipment was available on site to reheat food.

When asked about the frequency of deliveries from the central kitchens to the satellite locations, 135 (94.4%) responded that deliveries are made daily, 6 (4.2%) responded weekly, and 2 (1.4%) responded twice per week. The majority of the combination production system respondents (112; 78.3%) used a hot food delivery system. Food delivery was made using basic trucks or vans by 65 districts (58%); heated trucks or vans by 16 districts (14.3%); insulated trucks or vans by 16 districts (14.3%); heated or insulated carriers by 12 districts (10.8%); and refrigerated trucks or vans by 3 districts (2.6%). Respondents were asked to identify any equipment used to heat or re-heat foods following delivery to the satellite sites. Multiple answers were permitted. Convection ovens and ovens were identified most frequently (47 comments each), followed by stoves, cooktops, steamers, and steam tables (46 comments). Less frequently

mentioned were warmers and warming cabinets (17 comments) and microwave ovens (10 comments).

Twenty-two of the combination production system respondents (15.4%) used a cook-chill system and 9 (6.3%) of the combination respondents used a cook-freeze system. Of these 31 respondents, 7 used only onsite inventories, 13 used central inventories and 11 used both types of inventories. Prepared foods were transported from either the central kitchen or the central warehouses by refrigerated truck or van (13), basic truck or van (12), insulated truck (3), or heated truck or van (3). Foods were reheated on site by convection oven (15), ovens (10), ranges or steamers (8), and heated boxes or carts (5) (more than one answer was permitted). Twenty of the 31 respondents (64.5%) indicated onsite food preparation in addition to reheating was conducted. Baking was the most frequently identified activity (12 comments) followed by frying (primarily French fries, 6 comments), steaming or heating vegetables (2 comments), and making sauces and gravies (1 comment). When asked if foods are delivered to locations other than schools, 10 of the 31 respondents (32.3%) indicated “yes.” Head Start or other daycare setting was identified by 7 of these 10 respondents.

In the current study, 160 respondents (45.3%) indicated they used only onsite kitchens within the school district. Although this sample was specifically selected to increase the likelihood that either combination production or central kitchen production systems would be reported, onsite kitchens were most prevalent. However, 34 of these 160 respondents indicated that they provided satellite service to some other facilities, most frequently child care settings. Conceptually, serving meals to other sites could be classified as a central kitchen type operation, although these school foodservice directors

did not classify their system this way. Investigating catering services may be a prudent addition to this methodology to capture this additional aspect of satellite service.

The second most frequently reported production system was a combination of central kitchen with some onsite kitchens (40.5%) followed by central kitchens alone (14.2 %). This subset of the respondents is of primary interest in this study. Central kitchens using a hot food production system were reported by 78% of this subgroup (Table 13). Cook-chill systems represented 16% of this subgroup and cook-freeze systems were reported by 6% of this subgroup. The responses to a question assessing the equipment used to deliver food from a central kitchen preparation site to satellite sites are presented in Table 14. Basic trucks and vans are most frequently used (59%) to deliver food from central kitchens to satellite sites followed by heated trucks or vans (16%). Equipment used on site to either maintain food temperatures, reheat food, or heat food that was delivered chilled or frozen are reported in Table 15. Convection ovens were reported most frequently followed by ranges, cook tops and/or steamers. Standard ovens, heating carts or warming cabinets, and microwave ovens were also reported.

Table 13

Frequency of Food Production Method for Central Kitchen and Combination Production Systems

Food Production Method	Central Kitchen Only Systems (n=50)	Combination Systems (n=143)	Subgroup Total (N=193)	Percent*
Hot Food Delivery	39	112	151	78
Cook-Chill System	9	22	31	16
Cook-Freeze System	2	9	11	6

* All calculations rounded to the nearest full percentage point.

Table 14

Equipment Used for Hot Food Delivery for Central Kitchen and Combination Production Systems

Hot Food Delivery Equipment	Central Kitchen Only Systems (n=39)	Combination Systems (n=112)	Subgroup Total (N=151)	Percent*
Basic Truck or Van	24	65	89	59
Heated Truck or Van	8	16	24	16
Insulated Truck or Cart	5	16	21	14
Heated Carrier		12	12	8
Refrigerated Truck	2	3	5	3

* All calculations rounded to the nearest full percentage point.

Table 15

Equipment Used Onsite to Heat or Reheat Food for Central Kitchen and Combination Production Systems

Equipment Used to Heat/Reheat Food On Site*	Central Kitchen Systems Hot Delivery	Central Kitchen Cook-Chill or Freeze	Combination Systems Hot Food Delivery	Combination Systems Cook-Chill or Freeze	Comments Subgroup Total (N=259)	Percent**
Convection Oven	12	5	47	15	79	30
Standard Oven	15	5	47	10	77	30
Ranges, Steamers, Cooktops	5	--	46	8	59	23
Heated Cart or Warming Cabinet	3	2	17	5	27	10
Microwave Oven	6	1	10	--	17	7
Total	41	13	167	38	259	100

*More than one response per district was permitted.

** All calculations rounded to the nearest full percentage point.

Consistent with the purpose of the NFSMI to disseminate information and education and training materials, two additional questions were included in this survey to assess school foodservice administrators' preferences for materials. A majority of respondents (77.3%, 273 responses) were familiar with NFSMI education and training materials. When asked to describe the preferred format for materials, 25.6% (70) indicated printed materials, 15.4% (42) preferred electronic media, 10.6% (29) preferred the NFSMI Web site, 24.2% (66) preferred both printed and electronic formats, and 22.7% (62) preferred printed, electronic, and Web based materials. Clearly, a variety of material formats is preferred by this group. Although NFSMI materials are recognized by a significant proportion of the potential school districts nationwide, almost one-fourth of this sample was unaware of NFSMI services. With approximately 17,000 school districts nationwide, 3,800 additional school districts could benefit from NFSMI resources and materials.

Summary

This descriptive study identified the characteristics of food production systems in general for school districts across the United States. The sample used in this study reflected a typical cross section of school districts based on the number of schools, enrollment, and percentage of free and reduced price meals. Forty-nine of 50 states were included. There were no statistical associations between enrollment or percentage of free and reduced price meals and type of production system. Drawing any conclusions regarding a link between these variables and type of production system is not appropriate.

Combination systems (central kitchen with one or more onsite kitchens) are more prevalent than central kitchen only systems. Hot food delivery from a central kitchen is reported most frequently in both the central kitchen only and combination production systems. Food is delivered using a basic truck or van (not heated) with either insulated containers or some type of equipment to hold hot food hot. Food deliveries are typically made on a daily basis. Foods are heated or reheated on site using convection ovens, standard ovens, ranges and/or steamers. Microwave ovens are used less frequently. Central warehouses for prepared food items from a central kitchen are used infrequently. Some limited food preparation is conducted on site at schools even in school districts reporting a central kitchen only system. Baking of French fries and some dessert items was reported most frequently. A number of school districts regardless of the food production system provide additional food services to external settings such as child care centers.

This information can be useful in planning renovations in existing school foodservice settings as well as for planning new school construction. Many school

districts interested in exploring a central kitchen production system may wish to consider a combination of central kitchen with onsite kitchens. Because hot food delivery is the most commonly reported practice, careful consideration of temperature maintenance during food transport as well as equipment for heating or reheating food on site is necessary. Both food safety and food quality are impacted by the equipment choices made to support these two activities.

References

- American School Food Service Association. (2002). *School foodservice and nutrition compensation study 2001*. Alexandria, VA: Author.
- Brown, D., & Hoover, L. (1991). Total factor productivity modeling in hospital foodservice operations. *Journal of the American Dietetic Association, 91*(9), 1088-1092.
- Cetron, M., & Davies, O. (2003). Trends shaping the future: Technological, workplace, management, and institutional trends. *The Futurist, 37*(2), 30-43.
- Church, I., & Parsons, A. (2000). The sensory quality of chicken and potato products prepared using cook-chill and sous vide methods. *International Journal of Food Science and Technology, 35*, 155-162.
- Dahl, C., & Matthews, M. (1980). Effect of microwave heating in cook/chill foodservice systems. *Journal of the American Dietetic Association, 77*(9), 289-295.
- Dahl, C., Matthews, M., & Lund, D. (1981). Effect of microwave heating in cook/chill foodservice systems. *Journal of the American Dietetic Association, 79*(9), 296-301.
- Dahl, C., & Matthews, M. (1979). Hospital cook/chill foodservice systems. *Journal of the American Dietetic Association, 75*(7), 34-37.
- Greathouse, K., & Gregoire, M. (1988). Variables related to selection of conventional, cook-chill, and cook-freeze systems. *Journal of the American Dietetic Association, 88*(4), 476-478.

- Greathouse, K., Gregoire, M., Spears, M., Richards, V., & Nassat, R. (1989). Comparison of conventional, cook-chill, and cook-freeze foodservice systems. *Journal of the American Dietetic Association*, 89(11), 1606-1611.
- Green, C. (1997). Cook-chill technology's effect on employee job satisfaction & food quality. *School Food Service Research Review*, 21(1), 57-62.
- Kim, T., & Shanklin, C. (1999). Menu item acceptability in conventional and cook-chill food production systems. *The Journal of Child Nutrition & Management*, 23(2), 61-66.
- McErlain, L., Marson, H., Ainsworth, P., & Burnett, S. (2001). Ascorbic acid loss in vegetables: Adequacy of a hospital cook-chill system. *International Journal of Food Science and Nutrition*, 52, 205-211.
- Martin, J., & Conklin, M. (1999). *Managing Child Nutrition Programs Leadership for Excellence*. Gaithersburg, MD: Aspen.
- Nettles, M. (1997). Research in food production systems. *Health Care Food and Nutrition Focus*, 13(10), 5-7.
- Nettles, M., & Gregoire, M. (1993). Operational characteristics of hospital foodservice departments with conventional, cook-chill, and cook-freeze systems. *Journal of the American Dietetic Association*, 93(10), 1161-1163.
- Nettles, M., Gregoire, M., & Canter, D. (1997). Analysis of the decision to select conventional or cook-chill system for hospital food service. *Journal of the American Dietetic Association*, 97(6), 626-631.

- Riell, H. (2002). Small-scale cook-chill. *Foodservice Director*, 15(4), 99.
- Rini, M., Cremer, M., & Chipley, J. (1981). Sensory and microbiological qualities of beef loaf in four commissary food service treatment. *Journal of the American Dietetic Association*, 78(5), 483-489.
- Rollin, J., Matthews, M., & Lund, D. (1979). Cook/chill foodservice systems. *Journal of the American Dietetic Association*, 75(10), 440-445.
- Sawyer, C., & Pestka, J. (1985). Foodservice systems: Presence of injured bacteria in foods during food product flow. *Annals Reviews in Microbiology*, 39, 57-67.
- Sobelman, R. (1986). Food production systems: Selecting the best alternative. *Hospitals Material Management*, 11(4), 17-20.
- Unklesbay, N. (1977). Monitoring for quality control in alternate foodservice systems. *Journal of the American Dietetic Association*, 71(10), 423-428.
- Unklesbay, N., & Unklesbay, K. (1978). Energy expended in alternate foodservice systems for chicken menu items. *Journal of the American Dietetic Association*, 73(7), 20-26.
- Williams, P. (1996). Vitamin retention in cook/chill and cook/hot-hold hospital foodservices. *Journal of the American Dietetic Association*, 96(5), 490-500.

Appendix A

Telephone Survey

Q: Introdac *****

My name is [INTERVIEWER NAME]. I am from the CARE Survey Research Laboratory at the University of Southern Mississippi. We are conducting a research project for the Applied Research Division of the National Food Service Management Institute.

A few weeks ago you should have received a letter in the mail informing you that you would be getting a call from us to complete a survey. Do you have time to answer the survey questions now?

Q: IRB *****

Thank you. This will only take about five minutes of your time. Let me assure you that your answers are confidential and will never be linked to you in any way. You may terminate the survey at any time and you do not have to answer any questions you do not want to answer or questions, which make you feel uncomfortable.

Are you still willing to answer these questions?

- 1 Yes
- 2 No

IF (Answer =2) SKIP TO notqal

Q: Q1 *****

What is your title?

Q: Q2 *****

How many Elementary schools are there in your district?

IF (answer = 0) SKIP TO Q4

Q: Q3 *****

Are the Elementary schools open or closed campuses?

[INTERVIEWER: IF RESPONDENT QUESTIONS DEFINITION OF OPEN/CLOSED...
OPEN CAMPUSES ALLOW STUDENTS TO LEAVE CAMPUS FOR LUNCH.

CLOSED CAMPUSES DO NOT ALLOW STUDENTS TO LEAVE CAMPUS FOR LUNCH.

- 1 OPEN
- 2 CLOSED
- 3 BOTH

Q: Q4 *****

How many Middle/Jr. High schools are there in your district?

IF (answer = 0) SKIP TO Q6

Q: Q5 *****

Are the Middle/Jr. High schools open or closed campuses?

[INTERVIEWER: IF RESPONDENT QUESTIONS DEFINITION OF OPEN/CLOSED...
 OPEN CAMPUSES ALLOW STUDENTS TO LEAVE CAMPUS FOR LUNCH.
 CLOSED CAMPUSES DO NOT ALLOW STUDENTS TO LEAVE CAMPUS FOR LUNCH.]

- 1 OPEN
- 2 CLOSED
- 3 BOTH

Q: Q6 *****

How many High schools are there in your district?

IF (answer = 0) SKIP TO Q8

Q: Q7 *****

Are they open or closed campuses?

[INTERVIEWER: IF RESPONDENT QUESTIONS DEFINITION OF OPEN/CLOSED...
 OPEN CAMPUSES ALLOW STUDENTS TO LEAVE CAMPUS FOR LUNCH.
 CLOSED CAMPUSES DO NOT ALLOW STUDENTS TO LEAVE CAMPUS FOR LUNCH.]

- 1 OPEN
- 2 CLOSED

3 BOTH

Q: Q8 *****

Which of the following categories best describes the enrollment for your school district?

- 1 Less than 2500
- 2 2501 - 5000
- 3 5001 - 10,000
- 4 Greater than 10,000

Q: Q9 *****

Now we have a couple of questions about your free and reduced price meals.

What is the percent of free meals you serve in the district?

[INTERVIEWER: IF THE RESPONDENT SAYS THEY "DON'T KNOW"...TRY TO GET THEM TO GIVE THEIR BEST GUESS.

IF THEY STILL DO NOT KNOW...ENTER 0 FOR THIS QUESTION AND THE NEXT QUESTION...AND ENTER THE TOTAL % IN Q12]

Q: Q10 *****

What is the percent of reduced price meals you serve in the district?

[INTERVIEWER: IF THEY STILL DO NOT KNOW THE BREAKDOWN BETWEEN FREE AND REDUCED PRICE, ENTER 0 FOR THIS QUESTION AND ENTER THE TOTAL NUMBER FOR FREE AND REDUCED IN NEXT QUESTION.]

IF (Q9+Q10 >0) Skip to Q12

Q: Q11 *****

What is the percent of free and reduced price meals you serve in the district?

Q: Q12 *****

Which of the following services are provided by your school district?

[INTERVIEWER: CHECK ALL THAT APPLY]

- 1 Breakfast
- 2 Lunch
- 3 After-school Snacks
- 4 Supper
- 5 Summer Feeding

Q: Q13 *****

What type of production system does your school district have?

- 1 Onsite kitchens
- 2 Central kitchen
- 3 Combination of onsite and central kitchens

IF (answer = 1) SKIP TO Q14

IF (answer = 2) SKIP TO Q16

IF (answer = 3) SKIP TO Q30

Q: Q14 *****

Does your onsite kitchen deliver to any other facilities other than schools? (such as daycare)

- 1 Yes
- 2 No

IF (answer = 2) SKIP TO Q45

Q: Q15 *****

What facilities do you provide delivery to?

Skip to Q45

Q: Q16 *****

How many satellite delivery sites are there?

Q: Q17 *****

How frequently are the deliveries of the prepared food?

- 1 Daily
- 2 Weekly
- 3 Other. Please specify.

Q: Q18 *****

How is the food stored and delivered?

- 1 Hot Food Delivery
- 2 Cook Chill System
- 3 Cook-Freeze System

IF (answer = 1) SKIP TO Q19
 IF (answer = 2) SKIP TO Q23
 IF (answer = 3) SKIP TO Q23

Q: Q19 *****

How is the food transported?

[INTERVIEWER: IF RESPONSE IS TRUCK, PLEASE CLARIFY IF REFRIGERATED TRUCK, HEATED TRUCK, INSULATED TRUCK or TEMPERATURE CONTROLLED CONTAINERS IN A BASIC TRUCK.]

Q: Q20 *****

How is the food kept hot?

Q: Q21 *****

Is there any equipment used to heat or re-heat food onsite at schools?

(READ ONLY IF NECESSARY: Equipment includes: convection ovens, standard ovens, microwave ovens, steam tables)

- 1 Yes
- 2 No

If (answer=2) SKIP TO Q45

Q: Q22 *****

Please list the any equipment used to heat or re-heat food onsite at schools.

Skip to Q45

Q: Q23 *****

Do you keep an onsite inventory of prepared foods or do you have a central warehouse?

- 1 onsite inventory
- 2 central warehouse
- 3 both

Q: Q24 *****

How is the food transported?

[INTERVIEWER: IF RESPONSE IS TRUCK, PLEASE CLARIFY IF REFRIGERATED TRUCK, HEATED TRUCK,INSULATED TRUCK or TEMPERATURE CONTROLLED CONTAINERS IN A BASIC TRUCK.]

Q: Q25 *****

How is the food reheated?

Q: Q26 *****

Is there any onsite food preparation in addition to reheating?

(READ ONLY IF NECESSARY.. this includes french fries, heating canned vegetables, or baking cookies)

- 1 Yes
- 2 No

IF (answer = 2) SKIP TO Q28

Q: Q27 *****

Please describe additional onsite food preparation.

Q: Q28 *****

Do you deliver to any facilities other than schools? (daycare)

- 1 Yes
- 2 No

IF (answer = 2) SKIP TO Q45

Q: Q29 *****

What other facilities do you deliver to?

SKIP TO Q45

Q: Q30 *****

How many onsite kitchens are there?

Q: Q31 *****

How many satellite school delivery sites are there?

Q: Q32 *****

Is there any equipment used to heat or re-heat food onsite at schools?

(READ ONLY IF NECESSARY: Equipment includes: convection ovens, standard ovens, microwave ovens, steam tables)

- 1 Yes
- 2 No

IF (answer = 2) SKIP TO Q34

Q: Q33

Please list the any equipment used to heat or re-heat food onsite at schools.

Q: Q34 *****

How frequently are the deliveries of the prepared food?

- 1 Daily
- 2 Weekly
- 3 Other. Specify

Q: Q35 *****

How is the satellite food delivered?

- 1 Hot Food Delivery
- 2 Cook Chill System
- 3 Cook Freeze System

IF (answer = 1) SKIP TO Q36

IF (answer = 2) SKIP TO Q38

IF (answer = 3) SKIP TO Q38

Q: Q36 *****

How is the food transported?

[INTERVIEWER: IF RESPONSE IS TRUCK, PLEASE CLARIFY IF REFRIGERATED TRUCK, HEATED TRUCK, INSULATED TRUCK or TEMPERATURE CONTROLLED CONTAINERS IN A BASIC TRUCK.]

Q: Q37 *****

How is the food kept hot?

Skip to Q45

Q: Q38 *****

Do you keep an onsite inventory of prepared foods or do you have a central warehouse?

- 1 onsite inventory
- 2 central warehouse
- 3 both

Q: Q39 *****

How is the food transported?

[INTERVIEWER: IF RESPONSE IS TRUCK, PLEASE CLARIFY IF REFRIGERATED TRUCK, HEATED TRUCK,INSULATED TRUCK or TEMPERATURE CONTROLLED CONTAINERS IN A BASIC TRUCK.]

Q: Q40 *****

How is the food reheated?

Q: Q41 *****

Is there any onsite food preparation in addition to reheating?

- 1 Yes
- 2 No

IF (answer = 2) SKIP TO Q43

Q: Q42 *****

Please describe other onsite food preparation in addition to reheating.

Q: Q43 *****

Do you deliver to any facilities other than schools?

- 1 Yes
- 2 No

IF (answer = 2) SKIP TO Q45

Q: Q44 *****

Please list the other facilities you deliver to other than schools.

Q: Q45 *****

Thank you for your help.

Now we would like to ask you a couple of questions about education and training materials.

Are you familiar with National Food Service Management Institute's education and training materials?

- 1 Yes
- 2 No

IF (answer = 2) SKIP TO Q47

Q: Q46 *****

How would you prefer to receive these materials?

- 1 Printed, ready for photocopying
- 2 Electronic copies which can be printed locally such as CD's
- 3 NFSMI Website material that can be printed locally
- 4 Both printed and electronic materials
- 5 All of the above
- 6 Other. Please specify

Q: Q47 *****

Our final question is...

What state is your school district located?

- | | | | |
|----------------|------------------|-------------------|-------------------|
| 1 Alabama | 25 Illinois | 51 Montana | 77 Rhode Island |
| 3 Alaska | 27 Indiana | 53 Nebraska | 79 South Carolina |
| 5 Arizona | 29 Iowa | 55 Nevada | 81 South Dakota |
| 7 Arkansas | 31 Kansas | 57 New Hampshire | 83 Tennessee |
| 9 California | 33 Kentucky | 59 New Jersey | 85 Texas |
| 11 Colorado | 35 Louisiana | 61 New Mexico | 87 Utah |
| 13 Connecticut | 37 Maine | 63 New York | 89 Vermont |
| 15 Delaware | 39 Maryland | 65 North Carolina | 91 Virginia |
| 17 Florida | 41 Massachusetts | 67 North Dakota | 93 Washington |
| 19 Georgia | 43 Michigan | 69 Ohio | 95 West Virginia |
| 21 Hawaii | 45 Minnesota | 71 Oklahoma | 99 Wisconsin |
| 23 Idaho | 47 Mississippi | 73 Oregon | 101 Wyoming |
| | 49 Missouri | 75 Pennsylvania | |

[INTERVIEWER: IF THEY ASK YOU ABOUT THIS QUESTION, REMIND THEM THAT THEIR ANSWERS ARE CONFIDENTIAL AND ARE NOT LINKED TO THEM, SO THAT'S WHY WE HAVE TO ASK IT]

Q: thanks *****

This completes the survey. Thank you very much for your time.

[INTERVIEWER: PRESS 1 TO TERMINATE]

IF REFUSAL ---- I am sorry to have bothered you.
Thank you for your time.

Appendix B

Information Letter

Insert Date

Insert Address

Dear (insert food service director name):

Within the next two weeks, we will be calling you from the National Food Service Management Institute from the University of Southern Mississippi as part of a research study. This is a nationwide survey in which we are seeking to identify the various types of food production systems in use by school districts of various sizes.

We are writing to you in advance of our telephone call because we have found that many people appreciate being advised that a research study is in process, and they will be called.

When our interviewer calls, he or she will ask to interview the food service director. Altogether the interview should only take about five minutes to complete. If by chance we should call at an inconvenient time, please tell the interviewer and they will be happy to schedule another call.

Participation in the research study is voluntary. You may terminate the call at any point. Your responses are confidential and anonymous. Information from the survey will be used to evaluate training programs and materials provided by the National Food Service Management Institute and to determine areas that require further research.

We appreciate your contribution and willingness to participate. If you have any questions, please don't hesitate to ask our interviewers. You may contact me directly by phone at 601-266-5773 or by email at denise.m.brown@usm.edu.

Cordially,

Denise Brown,
Director, Applied Research Division
National Food Service Management Institute

Appendix C

Number of Districts Responding by State

Number of School Districts by State Responding to Survey

State	Frequency	Percent	Cumulative Percent
Alabama	5	1.4	1.4
Alaska	5	1.4	2.8
Arizona	4	1.1	4.0
Arkansas	4	1.1	5.1
California	23	6.5	11.6
Colorado	6	1.7	13.3
Connecticut	5	1.4	14.7
Delaware	4	1.1	15.9
Florida	4	1.1	17.0
Georgia	6	1.7	18.7
Idaho	10	2.8	21.5
Illinois	15	4.2	25.8
Indiana	6	1.7	27.5
Iowa	8	2.3	29.7
Kansas	7	2.0	31.7
Kentucky	3	.8	32.6
Louisiana	7	2.0	34.6
Maine	6	1.7	36.3
Maryland	3	.8	37.1
Massachusetts	8	2.3	39.4
Michigan	21	5.9	45.3
Minnesota	8	2.3	47.6
Mississippi	6	1.7	49.3
Missouri	4	1.1	50.4
Montana	4	1.1	51.6
Nebraska	4	1.1	52.7
Nevada	4	1.1	53.8
New Hampshire	4	1.1	55.0
New Jersey	13	3.7	58.6
New Mexico	4	1.1	59.8
New York	16	4.5	64.3
North Carolina	8	2.3	66.6
North Dakota	6	1.7	68.3
Ohio	17	4.8	73.1
Oklahoma	8	2.3	75.4
Oregon	8	2.3	77.6

Number of School Districts by State Responding to Survey (continued)

State	Frequency	Percent	Cumulative Percent
Pennsylvania	9	2.5	80.2
Rhode Island	2	.6	80.7
South Carolina	4	1.1	81.9
South Dakota	5	1.4	83.3
Tennessee	3	.8	84.1
Texas	15	4.2	88.4
Utah	3	.8	89.2
Vermont	4	1.1	90.4
Virginia	4	1.1	91.5
Washington	10	2.8	94.3
West Virginia	2	.6	94.9
Wisconsin	11	3.1	98.0
Wyoming	7	2.0	100.0
Total	353	100.0	