ARTICLES

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Assessment of Food Safety Knowledge and Attitudes of Managers of Residential Childcare Institutions (RCCI) in the Northeast

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SUMMARY

A needs assessment survey was designed and performed to measure both food safety knowledge of and attitudes toward food safety issues of key foodservice personnel of Residential Childcare Institutions (RCCIs) in the Northeast region. A total of 1,230 surveys were distributed and received by individual RCCI site addresses; 186 were included in the analysis, for a 15.1% return rate. Respondents answered 44 questions on food safety topics in food safety content areas of cook/prepare, chill/cold storage, clean/hygiene, receiving/general storage, food handling and allergens. The response for the questions was agree, disagree, don't know or not applicable. A Likert scale response format was used for attitude questions. Descriptive one-way ANOVA and *t*-tests were run. Using 80% as the standard for subject mastery, only 27 of the 44 items (55%) met the proficiency standard, with cook/prepare (66%) and chill/cold storage (67%) having the lowest mean correct scores. Facilities with ≤ 20 residents scored significantly lower in total knowledge ($P < 0.05$) than larger institutions, with scores of 71% and 80%, respectively. Smaller facilities received significantly lower scores in 5 of the 6 content categories and were less likely to have food safety plans (67% versus 83% for larger) or recipes based on HACCP implementation (28% versus 64% for larger). Overall attitude scores reflected a positive belief about responsibilities for general food safety practices and implementation of food safety practices, policies, inspections and training. Eighty percent (80%) indicated that they would like to see food safety training provided for staff and/or residents.

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INTRODUCTION

The National School Lunch Program (NSLP) is a federally assisted meal program that operates in over 100,000 public and non-profit private schools as well as Residential Child Care Institutions (RCCI) and provides nutritionally balanced low-cost or free lunches and snacks. While the Food and Nutrition Service (FNS) branch of the USDA administers the program at the federal level, state education agencies administer the program through agreements with local or district level school food authorities *(21)*. In 2004, the Child Nutrition and WIC Reauthorization Act amended the National School Lunch Act so as to require the state school food authorities to implement a HACCP-based food safety program for the preparation and service of meals served during the school year, beginning July 1, 2005 (Public Law 108-265), for all institutions that participate in the NSLP or School Breakfast Programs (SBP) *(22)*. Because all NSLP and SBP recipients must comply with the food safety requirements, this new reauthorization requirement impacted not only the large school-based foodservice operations but also smaller Residential Child Care Institutions (RCCI). To comply with the USDA regulation, each site must implement a food safety plan based on a HACCP approach — identify the critical control points of the menu items, monitor the critical control points and keep records — as well as develop their standard operation procedures, including those related to sanitation *(22)*.

The term Residential Child Care Institution refers to a number of different institutions that provide short or long term residential and care services to children who, because of their circumstances, do not or cannot live in their family home. Such institutions meet a broad definition of "school" for purposes of providing Child Nutrition Programs (the National School Lunch Program, the School Breakfast Program, and in some cases, the After School Snack Program). RCCIs, by definition, can include homes for the mentally, emotionally or physically impaired, unmarried mothers and their infants, group homes, halfway houses, orphanages, temporary shelters for abused and/or runaway children, long term care facilities for the chronically ill and juvenile detention centers (7 CFR part 210) *(8)*. The RCCI definition allows both hospitals for chronically ill children and group homes or shelters serving as few as four children to qualify to participate in the federally funded meal program. While some RCCIs have staff that are highly trained and often already following HACCP principles (e.g., hospitals, training schools), many others function as a "group home" environment or transitional living program. These RCCIs often have staff or foodservice professionals who prepare meals but may have other duties as well *(2, 3)*.

In 2010, 11.6 million students in over 88,000 schools and RCCIs and 31.2 million students in over 101,000 schools and RCCIs participated in the breakfast and lunch programs, respectively *(18, 19, 20)*. While costs have increased, student participation in these programs has increased over the past five years, from 10.1 to 11.7 million students for breakfast and from 30.6 to 31.8 million students for lunch *(18)*. RCCIs have been serving significant numbers of meals over this period. In October, 2006, over 6,000 RCCIs around the country served 4.71 million breakfasts and 4.69 million lunches in the seven designated regions around the country, with the Western and Northeast (New England and New York) regions containing the most RCCIs, with approximately 1,500 and 1,270, respectively *(4)*. In 2010, while these two regions still had the largest number of RCCI facilities, each region now had about the same number of RCCIs enrolled in the lunch and breakfast programs (over 1,000). However, whereas the western region served the most meals, the Northeast ranked fifth and sixth among the regions in serving breakfast and lunches, respectively, indicating a larger number of smaller home-like facilities versus larger institutions. As more recent (October 2010) data indicate, while RCCI facilities have decreased nationwide to 4,948, and serving 3.74 million breakfasts and 3.68 million lunches *(5)*, the number of meals being served per facility has remained fairly constant. The employees serving food at these facilities, as in any larger institution, play a critical role in assuring that foods prepared and served are safe to eat. While studies of foodservice workers in the United States have shown that many employees engage in unsafe food handling practices that can put the "customer" at risk *(1)*, there has been no study to document the knowledge of food directors at these Residential Child Care Institutions, particularly the smaller, group home settings, that service small populations.

While targeted training programs are needed to assist RCCIs, particularly smaller facilities of 20 residents or less, to meet the HACCP-based food safety challenge, it was first necessary to assess the food safety knowledge of the RCCI food service directors or managers. The prevalence of smaller childcare facilities that were assisted by the Federal lunch and breakfast programs, thus requiring compliance with USDA food safety regulations, made the Northeast region an ideal place to implement a food safety needs assessment survey that would, ultimately, provide the foundation for development of training programs. The high number of RCCIs in the Northeast provided an ideal setting to understand knowledge and attitudes of RCCI food directors as preparation for developing appropriate training materials. Therefore, the overall goal of this research was to develop and perform a survey distributed to RCCIs in the northeast (New England states and New York) that would (1) assess the food safety knowledge underlying the food safety procedures/practices of RCCI site managers; (2) determine the foodservice/kitchen policies or operations; (3) assess the status of food safety training of personnel and 4) assess manager attitudes toward the importance of food safety integration into the foodservice operation at the RCCI.

MATERIALS AND METHODS

Sampling and data collection

Prior to survey implementation, a letter describing the project and survey was mailed to the directors of RCCI sponsor agencies. Because individual RCCI facilities are normally under the direction of a "sponsor" organization (e.g., three separate sites could have one sponsor organization) the letter was mailed in anticipation of possible questions from RCCI site supervisors, to garner assistance in encouraging site managers or foodservice/kitchen managers to participate in the survey.

Following the letter to sponsoring agencies, survey distribution followed the model of Salant and Dillman *(14)*. The

TABLE 1. Demographic characteristics of survey respondents at residential child care institutions (N = 186)

	Frequency	Percent
Position or Title		
Foodservice/Kitchen Manager	65	35
Director	57	31
Manager	34	18
Professional Staff	14	8
Other Administration	10	5
Other	6	3
Years in This Position		
Less than 1 year	17	9
1–2 years	31	17
3–5 years	40	21
6–10 years	30	16
11–15 years	21	11
Greater than 15 years	48	26
Participation in Food Safety Training in the Past 3 Years		
Yes	123	68
No	57	32
State Where Facility is Located		
Connecticut	9	5
Massachusetts	64	34
Maine	5	3
New Hampshire	12	7
New York	77	41
Rhode Island	19	10
Vermont	0	0
Average Number of Clients/Residents at Your Site		
1–10	45	24
11–20	44	24
21–50	39	21
51–100	34	18
Greater than 100	23	13
Description of Facility		
Residential/Group Home	149	80
Institution	20	11
School	9	5
Women's/Child Domestic Shelter	4	2
Shelter	3	2
Age Range of Residents/Clients		
0–6 years	2	1
7–18 years	129	69
Over 18 years	7	4
Other (extended ranges)	48	26

TABLE 1. Demographic characteristics of survey respondents at residential child care institutions (N = 186) *continued*

	Frequency	Percent
Description of Facility Population (checked all that applied)		
Emotionally Impaired	111	60
Group Home	58	31
Mentally Impaired	55	30
Juvenile Detention Center	36	19
Temporary Shelter for Abused or Runaway Children	33	18
Substance Abuse/Rehab	16	9
Developmental Challenges/Special Needs	16	9
Physically Impaired	16	9
Single Mothers and Their Infants	10	5
Long Term Care Facility for Chronically Ill	7	4
Orphanage	6	3
Halfway House	1	1
Other	13	7

questionnaire was mailed, in 2 complete mailings, directly to RCCI sites in April and May of 2008. Each survey packet contained the questionnaire, cover letter and postage-paid return envelope. The survey was completed anonymously. A complete packet was mailed a second time, 2-3 weeks later, with instructions to those who had already responded to the first solicitation to disregard the second. The northeast region consisted of New York and the New England states (Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont and Maine). Individual RCCI site addresses, obtained from the Departments of Education from each state, were sent surveys (total 1,329 surveys): CT (31 sites), ME (10 sites), MA (433 sites), NH (44 sites), NY (727 sites), RI (76 sites) and VT (8 sites). Ninety-nine surveys were returned as undeliverable, resulting in a pool of 1,230 surveys distributed and received. Completed surveys were returned by 201 respondents; 15 were discarded, primarily because of a large portion of incomplete responses. A total of 186 surveys were used in the analysis, for a 15.1% response rate.

Questionnaire

Respondents answered questions on food safety topics for a broad range of food preparation and personnel hygiene practices. The questionnaire was divided into five parts: background information, foodservice/kitchen policy and operations, food safety training for staff/residents, food safety knowledge pertaining to facility procedures and practices, and food safety attitudes of the site manager. The demographic/background section contained questions regarding information about the survey respondent and the facility. The section on foodservice/kitchen policy and operations was designed to ascertain if the facility had any food safety procedures in place as well as types of meals served on site, responsibility for meal preparation, and history of local/state inspections. The respondents were also queried as to any current food safety training and the preferred format for any future training.

The 44 "knowledge" questions were assessed based on the food safety procedures and practices in place at the facility and reflected the four elements (separate, cook, chill and clean) of food safety identified in the USDA/Partnership for Food Safety Education, Fight Bac!® program *(10)* as well as the FDA Model Food Code *(23)*. Questions were designed per protocol outlined in previous studies *(6, 7, 11, 12)*. The response for these questions was "agree", "disagree", "don't know" or "not applicable". The respondents were instructed to use "not applicable" only if the procedure or practice did not occur at their site. Knowledge-based questions were graded as correct or incorrect based on the USDA food safety curriculum *(10)* and the FDA Model Food Code *(23)*. For purposes of statistical assessment, "don't know" was considered an incorrect answer. Setting the standard for subject mastery at 80% correct is compatible with practices of food safety experts *(6, 7, 11, 12)*. Finally, 13 attitude statements describing the importance of food safety in the facility and implementation of a food safety program were rated on a 5-point Likert scale, with 1 = strongly disagree and 5 = strongly agree.

The protocol and questionnaire were approved by the University of Rhode Island Institutional Subjects Review Board. The survey items were reviewed for content validity and clarity by 13 food safety or special education experts at academic institutions from New England and other regions across the United States. All suggested changes were considered, and the questionnaire was revised prior to distribution based on these recommendations.

Data analysis

Data analysis was carried out using the SPSS statistical program, version 16.0 *(15)* Descriptive analyses (i.e., frequencies, distributions, ranges, standard deviations) were computed for all variables. One-way ANOVA followed by the Scheffé post hoc procedure, and *t*-tests statistics, were run to determine the statistical significance of differences between means. Item means

TABLE 2. Background characteristics of RCCI survey respondents for foodservice/kitchen policies and operations (N = 186)

	Frequency	Percent
Operation is a Licensed Food Establishment by Local or State Regulatory Authority		
Yes	131	71
No	34	19
Not sure	19	10
Frequency of Inspection in the Past 12 Months		
1 Time	62	34
2 Times	88	48
Has not been inspected	10	5
Don't know	25	13
Description of Foodservice Operation (checked all that applied)		
Prepared and served in a residential home	109	59
Prepared and served on site in a cafeteria-like setting	86	46
Prepared in a central kitchen and transported to a facility	22	12
Vendor operated	0	0
Other	9	5
Meals Served on Site (checked all that applied)		
Breakfast (mean = 49)	176	95
Lunch (mean = 58)	167	91
Only weekend and holidays	11	6
Dinner (mean = 48)	179	97
Primary Responsibility for Meal Preparation		
Residents only	3	2
Residents, supervised staff	28	15
Kitchen/foodservice staff only	82	44
Non-kitchen/foodservice staff with resident's assistance[1]	18	10
Staff, other than kitchen/foodservice staff[1]	16	8
Kitchen/foodservice staff or residential staff and residents/clients[1]	31	17
Other	7	4
Residents Engage in Any Part of the Foodservice Operation		
Yes	148	80
No	38	20
If *Yes* to Previous Question, Role of Residents in Foodservice Operation (checked all that applied)		
Receiving/shopping	52	35
Storing food	69	47
Preparing and/or cooking hot food	80	54
Preparing cold food (e.g., sandwiches, salads)	91	62
Setting the table	113	76
Serving food	78	53
Cleaning up	139	94
Preparing and packing lunches	49	33
Other	14	10
Facility Has a Food Safety Plan		
Yes	140	76
No	23	12
Don't Know	22	12
Facility Has a Policy Regarding Food Allergies		
Yes	168	90
No	13	7
Don't Know	5	3
Facility Has Written Standard Operating Procedures		
Yes	85	46
No	54	30
Don't Know	44	24

TABLE 2. Background characteristics of RCCI survey respondents for foodservice/kitchen policies and operations (N = 186) *continued*

	Frequency	Percent
Use of Recipes Based on Hazard Analysis Critical Control Points		
Yes	85	46
No	54	30
Don't Know	44	24
Keep Records of the Following (checked all that applied)		
General food production	108	58
Receiving of food	116	62
Storing, cooking and/or holding food	103	55
Cleaning/sanitizing food preparation area(s)	80	43
Pest control	118	63
Other	25	13
We do not keep food-related records	14	8
Use of Thermometers in Food Handling Procedures		
All of the time, as needed	111	61
Most of the time, as needed	34	19
Some of the time, as needed	27	15
Never	10	6

[1]These categories were created after examining responses to the "other" category.

for knowledge questions were rank ordered within categories from low to high by percent correct answers. Chi-square statistics were run when the relationships between variables were examined for observed versus expected frequencies. Reliability of the data was determined using Cronbach's alpha measure of internal consistency. Knowledge measurements were correlated with demographic variables. Significance of findings was set at $P < 0.05$.

RESULTS AND DISCUSSION

Characteristics of both the survey respondents and the facility foodservice operations that they supervise are shown in Tables 1 and 2. Specifically, Table 1 shows the demographics of the survey respondents at the RCCIs in the northeast region. Of the 186 survey respondents, 41%, 34%, and 10%, were from NY, MA, and RI, respectively. This weighted response rate compares favorably to the number of questionnaires sent to each state. Eighty-four percent considered themselves in a managerial position, with 48% and 52% in the position five or fewer and over five years, respectively. The majority (68%) indicated that they had had food safety training in the past 3 years. Eighty percent of those surveyed described their facility as a residential group home rather than an institutional setting, with the majority of the residents emotionally impaired and 69% of the RCCI clientele 7–18 years old. Finally, the respondents reported that the number of clients/site were about evenly split at below and above 20 residents per facility – 48% (89) had 20 or fewer residents and 52% (95) had over 20 clients.

The foodservice/kitchen policy and operational details of the facilities participating in the survey are shown in Table 2. The majority of the operations are licensed by local or state regulatory authority (71%) and had some frequency of inspection over the past year. The majority indicated that the meals served were prepared on site in a residential home and/or in a cafeteria-like setting. While kitchen or foodservice staff had the primary responsibility for meal preparation, residents were engaged in many parts of the foodservice operation. For those who indicated that residents had a role, statistical analysis indicated that residents participated to a greater extent in those facilities with 20 or fewer residents. For example, 68% of residents prepared/cooked hot food, versus 38% in facilities with over 20 clients; 49% participated in receiving/shopping, versus only 19% in the larger facilities; 74% participated in preparing cold food, versus only 47% in the larger facilities, and 59% participated in serving food, versus only 46% in the larger facilities.Residents helped clean up equally in small and large facilities. Smaller facilities (≤ 20 residents) had greater resident participation in a broad range of critical food handling tasks, along with much lower participation in the elements of a food safety program.

It appeared that food safety compliance for smaller facilities fell below that of larger RCCIs, despite the fact that all facilities surveyed were serving breakfast, lunch and dinners (86%–98% surveyed), and both groups were required to meet the regulatory requirements outlined by the USDA. Smaller RCCIs were significantly ($P < 0.05$) less likely to have a food safety plan (67% versus 83% for larger), significantly ($P < 0.05$) less likely to have an allergy policy (84% versus 96% for larger), significantly ($P < 0.05$) less likely to have written standard operating procedures (74% versus 91% for larger) and significantly ($P < 0.05$) less likely to have recipes based on HACCP (28% versus 64% for larger). Statistical assessment showed that in all cases, RCCI facilities with 20 or fewer clients had lower than expected participation in these critical food safety operational policies, whereas larger facilities exceeded expected values.

TABLE 3. RCCI personnel responses to survey knowledge questions grouped into food safety content categories and in rank order within category from low to high as percent correct (N = 186)

Survey Questions by Category	Disagree	Agree	Don't Know	N/A
Cook/Prepare	**Mean (%)**			
Recipes used in this facility specify both oven temperature and cooking time to ensure that the food is fully and safely cooked	**12**	76	8	4
The temperature of stuffing cooked inside a turkey or chicken is checked prior to serving to make sure it is at 145°F	**36**	22	15	27
Hot foods that are not served immediately are held at 130°F	**45**	27	23	5
Food thermometers used in this facility are regularly (at least once/week) checked for accuracy	24	**64**	9	3
Chicken is cooked until the temperature in the middle is a least 165°F	9	**68**	20	3
We use color to determine whether a hamburger or chicken is completely cooked	**71**	20	7	2
Soup or other foods, that have been fully cooked, cooled and kept in the refrigerator but are being served hot are reheated to at least 165°F	4	**78**	15	3
If requested, rare hamburgers are served	**91**	3	4	2
If cooked food is accidentally left out on the counter overnight, we reheat to 165°F and serve	**92**	1	4	3
Chill/Cool and Cold Storage				
Foods, like pasta or rice, can be held at room temperature for 2 hours if our residents don't eat at the same time	60	**18**	13	9
In our facility, very hot food is allowed to completely cool on the counter (room temperature) and then refrigerated	**45**	40	8	7
Deli meats or cold cuts are kept in the refrigerator until they are all gone or for no more than 3 or 4 days	19	**69**	7	5
A large container of hot food is often put in the refrigerator to cool the food safely	**73**	13	10	4
The temperature at the facility refrigerator is 41°F or below	8	**80**	11	1
Cold foods that are not served immediately are held at 41°F or below	7	**80**	11	2
Frozen meat or poultry is thawed on the counter or in the sink	**82**	11	5	2
Clean/Hygiene				
Staff or residents wash their hands with warm water and soap for at least 15 seconds before starting to prepare food	**12**	83	3	2
Hand sanitizers are used in our facility as the best way to wash hands	**66**	30	2	2
The water temperature of the dishwasher is checked	9	**77**	9	5
Food preparation areas are cleaned with hot water and soap	16	**80**	4	0
Food preparation areas are also sanitized with chemicals	10	**84**	5	1
Residents/staff who are ill are allowed to prepare, handle and/or serve food as long as they do not have a fever	**88**	5	5	2
Sponges and/or dishcloths used to wipe up liquid from raw meat or poultry are used to clean dishes if they have been rinsed with water	**90**	5	3	2

TABLE 3. RCCI personnel responses to survey knowledge questions grouped into food safety content categories and in rank order within category from low to high as percent correct (N = 186) *continued*

Survey Questions by Category	Disagree	Agree	Don't Know	N/A
Clean/Hygiene *(continued)*		Mean (%)		
Staff and residents wear clean clothing when preparing food	2	**93**	3	2
Food preparers with cuts on their hands must cover their hands with a bandage and glove or be reassigned	4	**94**	2	0
Fresh fruits and vegetables are washed before use	2	**95**	3	0
Food preparers wash their hands after handling raw meat, fish or poultry	0	**97**	2	1
Receiving/General Storage				
Before any food is prepared, the safety of the food is assessed by the way the food looks and smells	**3**	92	4	1
Plastic or glass containers that originally did not hold food, but have been properly cleaned, are reused to store food	**62**	32	4	2
Foods prepared at private homes can be served in our facility	**67**	20	2	11
Foods are date marked when received and after opened	10	**83**	6	1
There is a system in place to insure that a food item received first is used first	8	**87**	5	0
Food, used in this facility, is purchased from an approved vendor	1	**89**	7	3
Household or cleaning chemicals are stored with dry food ingredients, as long as they are in their original containers	**95**	4	1	0
Dry ingredients are stored in properly closed and labeled intact containers	1	**97**	2	0
Food Handling (Separate/Cross-contamination)				
After cutting up raw meat or chicken, the cutting board is wiped with a wet dishcloth or sponge before using the board to cut produce	**57**	36	3	4
At our facility, fresh produce is stored in the refrigerator above or below raw meat or poultry – wherever there is room	**67**	27	4	2
If food is purchased from a grocery store, raw meat, fish or poultry are packed separately from ready-to-eat foods from the deli or produce area	4	**70**	4	22
The sauce that is used to marinate raw chicken is served as a dipping sauce	**88**	2	3	7
Facility staff or residents may snack while preparing food	**90**	5	4	1
In our refrigerators, deli or lunchmeats and raw meats are kept separated	5	**91**	2	2
Staff or residents use the same spoon to taste and then stir the food	**96**	0	3	1
Allergens				
We adjust recipes and food handling practices for residents with food allergies	6	**89**	3	2
Food allergies of our residents are taken into consideration when planning meals at our site	1	**98**	1	0

TABLE 4. Mean (% correct) knowledge scores for RCCI survey respondents in food safety content categories

Content Category	Mean % correct	Question range (%) correct	Survey questions *below* mastery[1]	Total Questions
Cook/Prepare	66 ± 22	12 to 92	77.8%	9
Chill/Cool and Cold Storage	67 ± 21	18 to 82	57.1%	7
Clean/Hygiene	81 ± 14	12 to 97	27.3%	11
Receiving/General Storage	75 ± 15	3 to 97	37.5%	8
Food handling (separate/cross-contamination)	85 ± 19	57 to 96	42.9%	7
Allergens	94 ± 17	89 to 98	0%	2
Total Knowledge	76 ± 14	3 to 98	40.4%	44

[1] Minimum subject mastery @ 80% correct.

TABLE 5. Mean (% correct) knowledge score comparison for RCCI survey respondents in content categories from sites with less and more than 20 residents

Content Category	20 residents or less (N = 89)	More than 20 residents (N = 97)
Cook/Prepare	59 ± 23[a]	72 ± 18[b]
Chill/Cool and Cold Storage	61 ± 23[a]	73 ± 17[b]
Clean/Hygiene	79 ± 16[a]	83 ± 11[b]
Receiving/General Storage	71 ± 15[a]	78 ± 14[b]
Food handling (separate/cross-contamination)	80 ± 20[a]	89 ± 18[b]
Allergens	95 ± 17[a]	94 ± 17[a]
Total Knowledge	71 ± 15[a]	80 ± 11[b]

Note: Different superscript letters (a, b) within rows indicate significant difference at $P < 0.05$.

This trend of food safety integration/compliance into the daily foodservice operation by the larger facilities was further demonstrated by the extent to which thermometers were used during food handling procedures. Descriptive statistical assessment indicated that 75% of respondents in RCCIs with more than 20 clients reported using a thermometer all or most of the time, as needed, while only 47% of those in the smaller facilities reported the same frequency of use.

Total knowledge had an alpha reliability score of 0.89, indicating that the data were reliable for knowledge measures. Tables 3, 4, and 5 show the results of the knowledge scores by rank order, content categories, and size of facility, respectively. The content questions were designed to consider process HACCP and standard operating procedures and reflected separate, cook, chill and clean as well as receiving/storage and allergens. The bolded scores in Table 3 indicate the percent correct answers for each knowledge item. The rank ordering of all questions showed that only 27 of the 44 responses to the food safety practices/procedures (55%) met the 80% correct standard for subject mastery or proficiency. Mean percent scores ranged from 66% to 94% for the different content categories (Table 4), with cook/prepare (66%), chill/cool/cold storage (67%) and receiving/storage (75%) not meeting the standard for the survey population. While the mean percent score for receiving/storage was 75%, this response belies the fact that 92% of the survey respondents incorrectly thought that safety of food could be assessed by the way the food looks and smells (Table 3). This is a particular concern. Furthermore, 37.5% to 77.8% of the survey questions were below the standard for mastery in these 3 categories.

Significant differences in policy and procedural knowledge among the states were few; however, those respondents who

TABLE 6. RCCI respondents' (N = 177) attitudes toward food safety issues as response percentages

Category/Items		Attitude Score	Agree + Strongly Agree (%)
Responsibilities to general food safety practices			
1.	It is important to know which residents have food allergies.	4.72 ± .94	94
2.	Good personal hygiene practices help keep food safe to eat.	4.70 ± .95	93
3.	This facility has a responsibility to teach residents how to keep food safe.	4.36 ± 1.02	84
4.	It is important to teach food safety practices to the facility staff.	4.59 ± .95	91
5.	I believe that my decisions impact the safety of food at this facility.	4.42 ± 1.09	87
6.	It is important to improve food handling practices to reduce the risk of illness.	4.58 ± .94	93
Implementation of food safety practices, policies, inspection and training			
7.	Written food safety policies and procedures are necessary to keep food safe.	4.41 ± 1.02	86
8.	Staff that prepare food on-site should be involved in a food safety program.	4.44 ± .99	88
9.	It is necessary to have state/local regulations to ensure the safety of food served at this facility.	4.15 ± 1.15	77
10.	I believe it is important to work closely with our local/state health regulatory agency to ensure the safety of food served this facility.	4.21 ± 1.11	80
11.	I believe it is important to work closely with our State Department of Education to ensure the safety of the food served at this facility.	4.12 ± 1.16	75
12.	I believe it is important to have regular food safety inspections of our kitchens.	4.29 ± 1.06	85
13.	It is important to have regular food safety training sessions for staff.	4.37 ± .96	89
Average Attitude Score		**4.41 ± 1.02**	**86**

Attitude responses based on a 5-point Likert scale, 1 = strongly disagree, 2 = disagree, 3 = neither, 4 = agree, and 5 = strongly agree

had received food safety training within the past 3 years had significantly higher total scores as well as higher scores ($P < 0.05$) for all categories, except for allergens, than those who did not. While there was still a lack of proficiency in the same 3 categories for the trained respondents, those not recently trained had scores that fell below 80% in 5 of the 6 content categories. More important was the impact of facility size on procedural knowledge scores (Table 5). Using the 80% standard, the overall knowledge base for food safety practices, procedures and policies of sites with more than 20 residents was significantly higher ($P < 0.05$) than those of 20 or fewer for all categories assessed. The smaller institutions received low scores for cook/prepare (59%), chill/cool (61%) and receiving/storage (71%). While larger facilities did reach overall procedure/practice proficiency, they still did not reach the standard in key categories, receiving scores of 72%, 73% and 78% in the same three categories, respectively. These results reflect the risk factors normally associated with foodborne outbreaks in foodservice operations: improper holding temperatures, inadequate cooking, purchase and receipt of food from unsafe sources, contaminated equipment and poor personal hygiene *(13, 17)*. Strohbehn et al. *(17)*, who studied cross-contamination opportunities in both restaurants and noncommercial settings (assisted living, child care and schools) found observational pre-test food safety scores of assisted living and child care establishments to be 76.8% and 68.0%, respectively. Furthermore, the highest number of cross-contamination issues occurred in preparing/thawing and lack of standard operating procedures. Using a knowledge questionnaire, Park et al. *(9)* reported an average pre-training score of 49.3% for restaurant food handlers. These results were very similar to the data reported in this study. The knowledge assessment, designed to reflect food safety procedures and practices, resulted in similar low scores, and the lack of operational plans was particularly problematic in the smaller RCCI facilities. The less-than-proficient procedure and policy implementation,

TABLE 7. Description of food safety training needs for staff and/or residents by respondents at residential child care institutions (N = 186)

	Frequency	Percent
Food Safety Training Provided for *Program Staff*		
Yes	108	59
No	61	33
Don't Know	14	8
Food Safety Training Provided for *Residents/Students*		
Yes	80	44
No	70	39
Don't Know	10	5
Not Applicable	21	12
Food Safety Training Provided for *Foodservice/Kitchen Staff*		
Yes	128	70
No	13	7
Don't Know	7	4
No foodservice staff at this facility	35	19
Site Employs a Certified Food Safety Manager Staff Member		
Yes	116	63
No	50	27
Don't Know	18	10
***IF NO to Previous Question*, is Certified Food Safety Manager Required by Local/State Health Department?**		
Yes	4	6
No	34	54
Don't Know	25	40
Missing Response	123	
Like to See Food Safety Training Provided for Staff and/or Residents/Students		
Yes	145	80
No	21	12
Not Applicable	15	8
***If YES to Previous Question*, How Would You Like Food Safety Training Delivered? (checked all that applied)**		
On-site training – *all staff*	88	60
On-site training – *kitchen staff only*	38	26
On-site education – *residents/students*	77	53
Training via CD and computer	47	32
Training via written materials	48	33
Train-the-trainer to *train staff*	43	30
Train-the-trainer to educate *residents/students*	33	23
Training not necessary for this site	2	1
Other	5	3

particularly evident in the smaller RCCIs, could have a large impact, since 70% of those surveyed serve children, normally considered a high risk group, as well as a diverse group of emotionally, mentally and developmentally challenged clientele. Children less than 10 years old have been shown to experience one-third of the foodborne illnesses reported in the United States *(16),* and individuals with disabilities could be at risk for food safety problems *(24)*. Since the vast majority of the RCCIs surveyed (80%) indicated that they operated as residential/group homes, and 59% reported that the foodservice environment was in a residential home, these facilities could be operating in a manner similar to that of a domestic kitchen. Child care facilities and community-based homes both operate foodservice in similar settings, and other

researchers have obtained similar results when food safety knowledge/behavior was assessed. Walter et al. *(24)* assessed the staff of community-based homes for residents with developmental disabilities and found food safety knowledge lacking in areas such as storage and handling procedures. Staskel et al. *(16)* evaluated the food safety knowledge of the cooks in childcare facilities where food was prepared in kitchen-like settings; 50% of the cooks failed to achieve a passing score (75%). Practices such as use of thermometers to check food temperatures, cooling, and proper labeling/storage of food all had high rates of failure. Both studies found issues similar to those reported in this study, and both recommended training in these types of facilities. Training targeted to these settings has not been available.

The total attitude score, 4.41 ± 1.02, with an alpha reliability of 0.97, illustrated that respondents were generally supportive of integrating food safety practices and procedures into RCCI foodservice operations (Table 6). Attitude scores fell into two categories: (1) attitudes toward responsibilities to general food safety practices and (2) attitudes toward implementation. RCCIs with ≤ 20 residents had a significantly ($P < 0.05$) lower attitude score (4.26 ± .92; data not shown) than larger facilities (4.55 ± 0.83). Respondents from smaller facilities (≤ 20 residents) had significantly lower attitude scores ($P < 0.05$) than larger institutions for *all* questions in the implementation category (data not shown). While still positive, this would indicate that although managers at smaller sites realize the importance of integrating food safety into the daily activities of their foodservice operation, they are not as amenable toward the actual implementation. These attitude patterns might also be due to the degree of actual food safety training. While 68% of all surveyed (Table 1) indicated that they had received food safety training in the past 3 years, statistical analysis revealed significantly less-than-expected training ($P < 0.05$) for the smaller RCCIs and significantly higher training participation in the larger RCCIs. Overall, there was a positive attitude toward the need to implement food safety practices, provide training for staff and residents, and comply with health regulatory requirements.

Table 7 shows food safety training needs of RCCIs. Currently, sites appear to provide food safety training to foodservice/kitchen staff (70%) and to a lesser extent to program staff (59%) and residents (44%). In addition, 63% of respondents indicated that they employ a certified food safety manager. Results indicate that the majority of RCCI site managers/directors would like to see on-site training for all staff and residents/students (60% and 53%, respectively). Further data analysis indicated that many small and large sites provided food safety training, 57% and 69% respectively, and employed a certified food safety manager. Furthermore, the desire to have training provided for small and large facilities was the same — 80% of small (≤ 20 residents) and large institutions. Finally, 68% and 50% of respondents at the smaller RCCIs surveyed wanted on-site training for all staff and residents, respectively, while only 6% were interested in focusing on kitchen staff. While larger facilities wanted on-site training for all staff and residents (53% and 55%, respectively), these respondents were also interested in training for kitchen staff only (46%). The difference in these responses for training needs would be expected, since all staff in smaller facilities could be involved in some aspect of meal preparation. Of those respondents from larger facilities, 85% reported that either kitchen/foodservice staff only or residents with kitchen staff supervision had primary responsibility for meal preparation. However, those RCCIs with ≤ 20 residents indicated that responsibility for food preparation was attributed to a variety of groups: residents supervised by staff (25%), kitchen/foodservice only (26%), non-foodservice staff with resident assistance (19%), residential staff only (16%) and/or foodservice staff with client help (9%). In the studies cited previously *(9, 17)*, training intervention resulted in an increase in knowledge but small gains in behavior change. Therefore, even though on-site training was desired by the respondents in this study, any training designed for this target audience as a result of this needs assessment would require not only follow-up observational assessment but also evaluation by participants as to the usefulness and effectiveness of the training.

CONCLUSIONS

Results of the survey clearly support the need for outreach programming and training, targeting RCCIs of 20 residents or less in an effort to promote compliance with USDA regulations. In addition, training should emphasize cooking and cooling procedures. Development of food safety training opportunities for RCCI staff and a curriculum format that is delivered, on-site, by food safety professionals will be developed, pilot tested, evaluated and implemented. In addition, educational tools that staff can use with their residents should be part of the overall outreach strategy.

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