

# CHILD NUTRITION PROFESSIONALS' KNOWLEDGE AND TRAINING PRACTICES REGARDING FOOD ALLERGIES IN U.S. SCHOOLS

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## ABSTRACT

To examine training and knowledge requirements about food allergies for Child Nutrition Professionals (CNPs), 1500 randomly selected CNPs in the U.S. were surveyed. Mean food allergy knowledge score of 350 respondents was 31.9±3.3 (max=39). Forty percent of CNPs (n=140) provided food allergy training, and the majority used group training (n=96) annually (n=76). Those who had received food allergy training and demonstrated higher knowledge scores were more likely to provide food allergy training. Lack of time and financial resources were barriers to providing food allergy training. Food allergy training is needed to prevent food allergic reactions in child nutrition programs.

**Keywords:** Child Nutrition Programs, food allergy, knowledge, training, barriers

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## INTRODUCTION

A Food allergy is an adverse health effect arising from a specific immune response that occurs reproducibly on exposure to a given food (National Institute of Allergy and Infectious Disease [NIAID], 2010). A food allergic reaction occurs after direct contact, consumption, or even inhalation of food allergens. It is estimated that 6 million children in the United States (U.S.) have food allergies and this number continues to rise (Gupta et al., 2011). Between 2004 and 2006, there were a total of 9,537 hospitalizations due to diagnosed food allergies among children aged 17 years or younger compared to 4,135 between 2001 and 2003 (Centers for Disease Control and Prevention [CDC], 2008). Because food allergies are incurable, avoidance of known food allergens is crucial for this population (Food Allergy Research and Education, 2013).

Most children spend over 30 hours a week in the school environment (National Institute of Child Health and Human Development [NICHD], 2012); therefore, school professionals play a significant role in providing a safe environment for children with food allergies. A study showed that over 60% of the 4,586 children who were registered with the Peanut and Tree Nut Allergy Registry experienced allergic reactions either at schools or in childcare centers (Sicherer, Furlong, Desimone, & Sampson, 2001). Furthermore, 10 out of every 63 fatalities in educational institutions occurred due to food allergic reactions (Munoz-Furlong & Weiss, 2009). Within schools, cafeterias are a common location where food allergic reactions occur. For example, research conducted in Mississippi revealed that 17% of the reported food allergic reactions in 2009 occurred in school cafeterias (Pulcini, Marshall, & Naveed, 2011).

Hidden food allergens in processed foods and cross-contact between allergen-containing food and non-allergenic food have been found to be the main reasons for food allergic reactions in schools (Molaison & Nettles, 2010). Lack of awareness about food allergies among cafeteria and general staff at schools and the inability to respond promptly to an allergic reaction lead to multiple fatalities (Yunginger, Squillace, Richard, Jones, & Helm, 1989). Schools nationwide have implemented various strategies to prevent food allergic reactions, such as providing meal substitutions, establishing allergen-free areas, and instituting "no food sharing" policies (Nowak-Wegrzyn, Conover-Walker, & Wood, 2001). However, some parents of children with food allergies reported that schools were unprepared to accommodate their children's needs (Nowak-Wegrzyn et al., 2001).

The Americans with Disabilities Act of 1990 (ADA) requires that public schools accommodate children with food allergies. The Amendment of the Rehabilitation Act 1973, Section 504, also prohibits federally funded schools from discriminating against students with disabilities or special needs (Asthma and Allergies Foundation of America [AAFA], 2013). The U.S. Department of Agriculture's (USDA) guideline entitled "Accommodating Children with Special Dietary Needs" suggests that children with food allergies should be provided safe replacement meals according to the instructions and advice of their physicians (USDA, 2013).

Food allergy training is imperative for enhancing necessary knowledge and food handling skills of food handlers. A study conducted in Texas found that food allergy knowledge of school foodservice employees improved significantly following a food allergy workshop (Lemons, 2004). Nevertheless, food allergy training has neither been adequately addressed nor provided to school foodservice employees (Pulcini et al., 2011). For instance, among 37 schools studied, 62 classroom teachers, 48 administrators, and 22 teaching assistants have been trained on food allergic reactions, whereas only five foodservice staff received such training (Pulcini et al., 2011). Obtaining more information regarding school foodservice employees' knowledge may assist in identifying food allergy training needs and consequently preventing future food allergic reactions in school foodservice operations. However, currently there is a paucity of research regarding food allergy knowledge and training practices in school foodservice operations. This gap in research underscores the purpose of this study, to examine the training and knowledge requirements about food allergies among Child Nutrition Professionals (CNPs). This study also aimed to examine the barriers to providing food allergy training and identifying strategies to overcome such barriers to increase food allergy training in school foodservice operations.

## METHODS

### Subjects

Prior to data collection, an approval to use human subjects for this study was obtained from Kansas State University Institutional Review

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Board. The target population was defined as CNPs such as directors, managers, and other supervisory personnel involved in planning or implementing training programs in school foodservice operations in the U.S.

To collect information on CNPs, we accessed a database comprised of school district websites from 37 states; this database was previously developed for use in other studies on child nutrition programs. Each school district website listed in this database was accessed, and the list of names, postal addresses, and email addresses of CNPs was compiled into a separate database and further categorized based on the seven USDA Food Distribution Regions (USDA, 2012). Overall, the school district websites provided data for 3,588 CNPs, of which 1,500 CNPs were selected from all the geographic regions of the U.S. as the study sample. The sample size was calculated based on Dillman, Smyth, and Christian's (2007) recommendations that a population of 2,000–4,000, with a sampling error of  $\pm 5\%$ , 50/50 split, with an anticipated response rate of 25%, requires a sample size of 322–351 respondents for research.

### Instrument Development

To identify relevant variables for the national survey, three focus groups were conducted with 21 CNPs who had attended a training program sponsored by a Department of Education of a Midwestern state Child Nutrition and Wellness Program or an annual state School Nutrition Association conference. The focus group participants were recruited through emails sent by the meeting organizers and briefed about the research purpose and the anonymity of their responses. Each participant completed a demographic questionnaire and signed a consent form prior to participating in the discussion. During the focus group sessions, the CNPs were asked open-ended questions regarding the research objectives based on a structured discussion guide (Hennink, Hutter, & Bailey, 2011). Each focus group session lasted for approximately one hour and was audio-recorded. The recordings were transcribed by a professional transcription company ([www.cabbagetreesolutions.com](http://www.cabbagetreesolutions.com)). The transcript was validated against the audio recording and then independently coded by two facilitators. The codes were compared and reconciled to limit redundancy, and they were used to develop common themes for the quantitative survey questionnaire.

An online questionnaire was developed based on focus group results and the previous literature (Lemons, 2004; Molaison & Nettles, 2010). The questionnaire comprised four sections and the following items: 12 items to define demographic characteristics, 14 items about food allergy training practices, 12 items about food allergy knowledge, nine items about attitude toward food allergies, eight items related to issues dealing with food allergies, seven items about perceived barriers to providing food allergy training, and five items about cues that influence the respondents' decision to provide food allergy training. Food allergy knowledge was assessed using multiple choice or true/false questions. The maximum possible score for the food allergy knowledge was 39. Attitudes and perceived barriers to food allergy training were measured using 5-point Likert-type scales, ranging from 1, "strongly disagree", to 5, "strongly agree".

A pilot study was conducted with a convenience sample of 15 CNPs. Cronbach's alpha tests were used to evaluate inter-item reliability and  $\alpha > 0.70$  was considered acceptable for internal consistency (Cronbach, 1951). The results of the Cronbach's alpha test indicated that all scales measuring the attitude toward food allergies ( $\alpha = 0.76$ ) and perceived barriers ( $\alpha = 0.90$ ). The participants of the pilot test were also asked to rate the clarity of the instructions and questions. No further revisions were made to the questionnaire after the pilot study.

### Data Collection and Analyses

The survey invitation, which included an introduction and link to the online survey, was sent independently through email to each participant. Follow-up email reminders were sent twice to non-respondents before concluding the 3-week survey (Dillman, 2000).

The Statistical Package for the Social Sciences (SPSS) (version 19.1.21, 2011, SPSS, Chicago, IL) was used for data analysis. Prior to this, dummy coding was applied to recode several variables (i.e., whether a participant had received training previously, had a food allergy, or had family members with food allergies). To determine the most desirable topics for food allergy training, each respondent was asked to rank three of the six options. Subsequently, the top ranked item was recoded as "3," and the second and third ranked items were recoded as "2" and "1" respectively. Other items were recoded as "0." The mean score of each item was calculated and used to evaluate the relative importance of each topic. For knowledge questions, correct and in-correct answers were re-coded as "1" and "0." Total knowledge scores (i.e., the sum of correct answers) were calculated using the "compute" function of SPSS prior to further analyses. Independent sample t-tests and analysis of variance (ANOVA) with post-hoc analyses were used to compare the mean scores of knowledge and other scaled data for CNPs with different demographic characteristics. The most challenging barriers to providing food allergy training were evaluated using the repeated measures multivariate ANOVA (MANOVA) tests. Logistic regression was used to investigate variables that were associated with the implementation of food allergy training during the past 12 months. Statistical significance was set at  $p < 0.05$ .

## RESULTS

### Response Rate and Participant Characteristics

Of the 1,500 invitation emails sent, 72 were undeliverable, yielding an effective sample size of 1,428. After excluding 75 incomplete questionnaires, 340 usable questionnaires (23.8%) were available for data analyses. The majority of respondents were female ( $n = 309$ , 90.9%) and belonged to the age group of 51–60 years ( $n = 163$ , 47.9%). Moreover, most of the respondents held a bachelor's degree ( $n = 109$ , 32.1%) and were directors of school nutrition or foodservice programs ( $n = 264$ , 77.6%). Approximately 39% ( $n = 131$ ) of the respondents held School Nutrition Specialist or School Nutrition Professional certificates, and 18% held the Registered Dietitian (RD) credential ( $n = 60$ ). Approximately 73% ( $n = 248$ ) of the respondents held ServSafe® certification (Table 1).

The respondents' overall length of service in school foodservice ranged from three months to 40 years (mean =  $16.0 \pm 9.8$  years), whereas their length of service in a management position ranged from three months to 35 years (mean =  $12.5 \pm 8.4$  years). Of the 296 respondents who worked at the school district level, 116 respondents (39.2%) were employed at small districts (up to 2,499 students), 112 (37.8%) at medium-sized districts (2,500–9,999 students), and 68 (23.1%) at large districts (over 10,000 students) (Table 1).

Of 340 respondents, 60.0% ( $n = 204$ ) had received food allergy training, mainly through professional conferences/workshops ( $n = 166$ ), self-study ( $n = 131$ ), and/or on their job ( $n = 122$ ). Most of the respondents indicated that they had obtained food allergy training materials from state agencies ( $n = 165$ , 48.5%), School Nutrition Association (SNA) ( $n = 161$ , 47.4%), and USDA Food and Nutrition Services (FNS) ( $n = 149$ , 43.8%). Others indicated that they had obtained resources from the Academy of Nutrition and Dietetics (formerly known as the American Dietetic Association), State Dietetic Associations, school nurses, and contract management companies (Table 2).

Among respondents who worked at the district level (n = 270) or were responsible for operations in multiple schools (n = 26), 221 had received special dietary requests due to food allergies in the current academic year (range = 1 to 910). Of the remaining 44 respondents, who were responsible for operations in a single school, 35 had received the similar requests (range = 1 to 100). Allergic reactions in school cafeterias were rare, with 251 respondents (73.5%) indicating “zero” incidences in the past 12 months. Very few respondents reported one (n = 18, 5.4%), two (n = 13, 3.8%), and three (n = 2, 0.6%) allergic reactions in their facilities.

### Food Allergy Knowledge and Training

Of the maximum 39 points possible, the mean food allergy knowledge score was 31.9 ± 3.3 (range = 22 to 38). CNPs had basic food allergy knowledge regarding the consequences (i.e., a food allergic reaction could lead to death [98.2%]), causes (92.1%), and lack of a cure for food allergies (87.9%). Approximately 21% (n = 71) of the respondents failed to recognize that lactose intolerance and milk allergy were two different conditions. Only 25.0% of the respondents (n = 85) recognized the current Food Allergen Labeling and Consumer Protection Act (FALCPA) requirements that the major eight food allergens needed to be listed on food labels. For multiple choice questions, most of the respondents accurately identified all the

**Table 1. Characteristics of Child Nutrition Professionals (n = 340)**

Characteristics	n	%
Gender		
Female	309	90.9
Male	31	9.1
Age (years)		
21-30	19	5.6
31-40	45	13.2
41-50	75	22.1
51-60	163	47.9
61 or older	38	11.2
Education Level		
High school or General Education Development (GED)	53	15.6
Some college	73	21.5
Associate degree	32	9.4
Bachelor's degree	109	32.1
Master's degree	61	17.9
Doctoral degree (PhD, EdD, etc.)	2	0.6
Other	10	2.9
Job Title		
Director of a school district	264	77.6
Manager of a single school	34	10.0
Coordinator of several schools	26	7.6
Coordinator of a certain program within a school district	6	1.8
Supervisor within a single school	10	2.9
Professional Credentials <sup>a</sup>		
School Nutrition Specialist	131	38.5
Registered Dietitian (RD)	60	17.6
Certified Dietary Manager	20	5.9
Dietetic Technician, Registered	5	1.5
Other	158	46.4
Food Safety Certification <sup>a</sup>		
ServSafe <sup>®</sup>	248	72.9
Food handlers' certification	103	30.3
Food safety certification by state	78	22.9
I do not currently hold any food safety certification	30	8.8
Other	27	7.9

<sup>a</sup>The total number of responses exceeded 340 due to multiple responses.

common symptoms of food allergic reactions (range = 87.9% to 98.2%) except vomiting (n = 242; 71.2%) and asthma (n = 186; 54.7%).

Over 90% of the respondents were able to identify six of eight major allergens correctly. However, 36.8% (n = 125) and 24.4% (n = 83) of the participants did not recognize soy and fish as major allergens, respectively. Only 29.4% (n = 100) of participants recognized all eight major allergens.

Approximately 19% (n = 63) of the respondents correctly identified all the terms used to indicate the presence of peanut or peanut derivatives except “arachis oil,” which was recognized by only 76 participants (22.4%). Less than 15% (n = 50) correctly identified that milk allergen may be present in the form of “artificial butter flavor” (Table 3).

Independent sample t-tests showed that the participants with RD credentials had significantly higher food allergy knowledge scores (34.4 ± 2.9) than others (31.3 ± 3.2) (t = 4.73, P < 0.05). Results of one-way ANOVA analyses indicated that food allergy knowledge scores also differed based on the size of the school districts (F = 13.65, P < 0.001). The respondents who worked for small districts had significantly lower food allergy knowledge scores (31.2 ± 2.9) than their counterparts from medium (32.7 ± 3.0, P < 0.05) and large (33.5 ± 3.1, P < 0.001) districts.

Of those who had provided employee food allergy training during the past 12 months (n = 140, 41.2%), most training was provided by the respondents themselves (CNPs, n = 99). Food allergy training was provided either as stand-alone sessions (n = 74) or as a part of general food safety training (n = 68). Out of six given choices, the following three topics were ranked as the most important topics to be included in the food allergy training: “Identifying food items that contain allergens” (1.9 ± 1.2), “Avoiding cross-contact with food allergens” (1.0 ± 1.1), and “Reading ingredient listings” (0.9 ± 1.1), in that order.

**Table 2. Respondents' Previous Food Allergy Training (n = 340)**

Characteristics	n	%
Previous food allergy training received		
Yes	204	60.0
No	136	40.0
Methods of Training <sup>a</sup>		
Professional conferences or workshops	166	48.8
Self-study (e.g., reading, education modules, etc.)	131	38.5
Through the daily work done at the job	122	35.9
Academic degree program (college courses, technical schools, etc.)	47	13.8
Other	15	4.4
Sources of Food Allergy Training Materials <sup>a</sup>		
State agency (e.g., Department of Education)	165	48.5
School Nutrition Association (SNA)	161	47.4
USDA, Food and Nutrition Services (FNS)	149	43.8
National Foodservice Management Institute (NFSMI)	100	29.4
Food Allergy and Anaphylaxis Network	87	25.6
I have not obtained materials from any of these organizations	73	21.5
Other	31	9.1

<sup>a</sup>The total number of responses exceeded 340 due to multiple responses.

**Table 3. Food Allergy Knowledge Scores among Respondents (n = 340)**

Questions	n (%)	
	Answered Correctly	Answered Incorrectly
Food allergic reactions occur when the body's immune system reacts to the proteins in the food.	199 (58.5)	141 (41.5)
Lactose intolerance is the same as having a milk allergy.	269 (79.1)	71 (20.9)
A child can die from a food allergic reaction.	334 (98.2)	6 (1.8)
Modern medicine can cure food allergies.	299 (87.9)	41 (12.1)
A food allergic reaction can occur if a child touches a food item that contains allergens.	313 (92.1)	27 (7.9)
If a student has a milk allergy, removing cheese from an already assembled deli sandwich will prevent an allergic reaction.	290 (85.3)	50 (14.7)
Federal law requires all food allergens to be listed on food labels.	85 (25.0)	255 (75.0)
Mark ALL symptoms or conditions in the following list that could indicate that someone is having a food allergic reaction:		
Hives/rashes <sup>a</sup>	335 (98.5)	5 (1.5)
Swelling of throat <sup>a</sup>	334 (98.2)	6 (1.8)
Facial swelling <sup>a</sup>	331 (97.4)	9 (2.6)
Tingling sensation in or around the mouth <sup>a</sup>	326 (95.9)	14 (4.1)
Shortness of breath <sup>a</sup>	322 (94.7)	18 (5.3)
Anaphylaxis <sup>a</sup>	299 (87.9)	41 (12.1)
Vomiting <sup>a</sup>	242 (71.2)	98 (28.8)
Asthma <sup>a</sup>	186 (54.7)	98 (28.8)
Which of the following are the <b>EIGHT MAJOR FOOD ALLERGENS</b> ?		
Peanut <sup>a</sup>	340 (100.0)	0 (0.0)
Shellfish (shrimp, lobster, crab, etc.) <sup>a</sup>	333 (97.9)	29 (2.1)
Eggs <sup>a</sup>	332 (97.6)	8 (2.4)
Milk <sup>a</sup>	325 (95.6)	14 (4.4)
Wheat <sup>a</sup>	325 (95.6)	14 (4.4)
Tree nuts (almonds, walnuts, pecans, etc.) <sup>a</sup>	311 (91.5)	29 (8.5)
Fish <sup>a</sup>	257 (75.6)	83 (24.4)
Soy <sup>a</sup>	215 (63.2)	125 (36.8)
Beef	333 (97.9)	7 (2.1)
Herbs (basil, thyme, chives, rosemary, etc.)	330 (97.1)	10 (2.9)
Citrus fruits (lemon, orange, etc.)	290 (85.3)	50 (14.7)
Corn	257 (75.6)	83 (24.4)
Artificial colorings (red dyes, yellow dyes, etc.)	184 (54.1)	156 (45.9)
A person with a <u>peanut allergy</u> should avoid products having which of the following on the ingredient label? Mark ALL the options that apply.		
"Processed in a factory that also processed food containing peanuts" <sup>a</sup>	334 (98.2)	6 (1.8)
"Whey"	333 (97.9)	7 (2.1)
"Contains peanuts" <sup>a</sup>	333 (97.9)	7 (2.1)
"May contain ground nut/mixed nuts" <sup>a</sup>	320 (94.1)	20 (5.9)
"Arachis Oil" <sup>a</sup>	70 (20.6)	270 (79.4)
A person with a milk allergy should avoid products having which of the following on the ingredient label? Mark ALL the options that apply.		
"Contains milk" <sup>a</sup>	338 (99.4)	2 (0.6)
"Milk solids" <sup>a</sup>	329 (96.8)	11 (3.2)
"Whey" <sup>a</sup>	240 (70.6)	100 (29.4)
"Casein" <sup>a</sup>	209 (61.5)	131 (38.5)
"Artificial butter flavor" <sup>a</sup>	50 (14.7)	290 (85.3)
The most effective response to a severe food allergic reaction is: Injecting epinephrine (EpiPen)	321 (94.4)	19 (5.6)

<sup>a</sup>Correct answers

### Barriers to Food Allergy Training

Perceived barriers to providing food allergy training for employees were assessed in two tiers. The respondents who indicated that “Providing food allergy training to the foodservice employees in my school district is difficult” or “very difficult” ( $n = 97$  out of 340 respondents) were directed to a list of questions related to challenges to implementing employee food allergy training. “Time constraints of the respondent themselves” ( $3.8 \pm 1.0$ ) and “The lack of time of the employees” ( $3.5 \pm 1.1$ ) were among the greatest training challenges. Another critical barrier to implementing food allergy training programs was financial resources ( $3.5 \pm 1.0$ ). “Lack of support from school administrators and staff” was not viewed as a major challenge ( $2.9 \pm 1.1$ ) because 45 of 97 respondents expressed a neutral view about the level of support offered by school administrators and staff (Table 5).

Logistic regression analysis (Logit) was performed to identify the variables that were associated with food allergy training during the past 12 months. The goodness-of-fit for the model was  $\chi^2 = 22.51$  ( $p < 0.01$ ), and it accurately predicted 34% of the responses regarding (pseudo  $R^2 = 0.340$ ) whether the food allergy training was implemented in the past. The results further showed that the scores for receiving previous food allergy training ( $B = 1.87$ ,  $p < 0.001$ ) and food allergy knowledge ( $B = 1.21$ ,  $p < 0.01$ ) were significantly associated with food allergy training implementation.

**Table 4. Food Allergy Training Practices in School Foodservice Environment (n = 340)**

Characteristics	n	%
Food Allergy Training Provided to Employees <sup>a</sup>		
Yes	140	41.2
No	200	58.8
Food Allergy Training Provider <sup>bc</sup>		
Themselves	99	70.7
Another staff manager	38	27.1
State agency staff	33	23.6
Private training provider	16	11.4
Other	20	14.3
Structure of Training <sup>b</sup>		
Part of food safety training	66	47.1
Separate session(s) on food allergies	74	52.9
Form of Training <sup>b</sup>		
Group training	96	68.6
Individual “one-on-one” training as needed	30	21.4
Other	14	10.0
Frequency of Training <sup>bc</sup>		
Annually to all foodservice employees	76	54.3
Once a year for foodservice employees who work directly with children with food allergies	52	37.1
When a foodservice employee is newly hired	33	23.6
Other	19	13.6
Total Hours of Training Provided <sup>b</sup>		
Less than 1 hour	59	42.1
1–2 hours	69	49.3
3–4 hours	8	5.7
More than 4 hours	4	2.9

<sup>a</sup>Sample size = 340

<sup>b</sup>Sample size = 140

<sup>c</sup>The total number of responses exceeded 140 due to multiple responses.

### DISCUSSION

To the best of our knowledge, this is the first study to have comprehensively assessed CNPs’ food allergy knowledge and established a baseline for current food allergy training practices in school foodservice operations. The demographics of the participants were similar with previous studies conducted among CNPs, such as predominantly females, aged 50 and above, and had a bachelor’s degree (Pratt, Bednar, & Kwon, 2012; Rushing, Nettles, & Johnson, 2009a). During the current academic year, a majority of the respondents (74.6% of the district-level CNPs and 79.5% of the school-level CNPs) reported that they had received special dietary requests due to food allergies, indicating that food allergies may become a persistent challenge in the school foodservice environment (Young, Munoz-Furlong, & Sicherer, 2009).

The level of knowledge regarding food allergies was fair to moderate, with the greatest opportunity for improvement related to distinguishing differences between food allergies and food intolerances, legal aspects of food allergies, symptoms of food allergies, and the terminology related to allergenic food ingredients. RDs demonstrated greater knowledge regarding food allergies than non-RDs, possibly due to the formal education and supervised practice requirements for RDs (Mincher, Symons, & Thompson, 2012). The data also suggests that directors from larger school districts had higher food allergy knowledge scores than their counterparts. This is possibly because large districts are equipped with more robust technological infrastructures (Rushing et al., 2009b) have access to different resources (Youn & Sneed, 2003), and are led by more experienced directors (Youn & Sneed).

Two-thirds of the respondents had completed some form of food allergy training, primarily by self-study, daily work, or attending professional conferences. Meanwhile, another study found that food allergy management skills were learned and developed through conferences (37%), course work (29%), and mentoring (20%) (Carlisle, Vargas, & Noone, 2010). This suggests that respondents mostly depend on themselves to explore the topic of food allergies. More systematic and structured food allergy training programs may enable CNPs to develop appropriate knowledge about food allergy management.

Although the federal government has mandated several food safety programs, similar regulations for food allergy training have not yet been firmly established. The 2011 School Nutrition Association Operations Report showed that 55.6% of the respondents required all of their employees to be trained about food safety (School Nutrition Association [SNA], 2011); however, this study showed that less than half the respondents had provided food allergy training to their employees (41.2%,  $n = 140$ ). A previous study found that, on average, kitchen managers received over 10 hours of food safety training, whereas food handlers underwent eight hours of training (SNA, 2011). Our study found that 59 participants received less than one hour and another 69 received one to two hours of food allergy training. Since managing food allergies presents similar challenges to managing food safety risks, efforts to promote food allergy training should be encouraged in the school foodservice environment.

The three top-ranked topics for food allergy training were identifying food items that contain allergens, avoiding cross-contact with food allergens, and reading ingredient lists. This finding was consistent with a previous study indicating that reading labels (66%), menu or recipe substitution (56%), and cross-contact prevention (50%) were among the important topics related to food allergies (Verduin & Corbett, 2009). Understanding CNPs’ topics of interest and food

**Table 5. Perceived Barriers to Providing Employee Food Allergy Training (n = 97)<sup>a</sup>**

Items	Mean ± SD	n (%)				
		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I don't have enough time	3.8 ± 1.0 <sup>w</sup>	2 (1.9)	11 (10.5)	18 (17.1)	49 (46.7)	25 (23.8)
I don't have adequate funding	3.5 ± 1.1 <sup>x</sup>	5 (4.8)	14 (13.3)	28 (26.7)	35 (33.3)	23 (21.9)
Employees don't have time to attend food allergy training	3.5 ± 1.1 <sup>x</sup>	6 (5.7)	13 (12.4)	24 (22.9)	42 (40.0)	20 (19.0)
Training resources are not easily accessible	3.5 ± 1.0 <sup>x</sup>	3 (2.9)	13 (12.4)	31 (29.5)	40 (38.1)	18 (17.1)
There is a lack of food allergy expertise in my district	3.4 ± 1.0 <sup>x</sup>	5 (4.8)	10 (9.5)	35 (33.3)	42 (40.0)	13 (12.4)
Employees aren't interested in learning about food allergies	3.2 ± 1.0 <sup>xy</sup>	7 (6.7)	18 (17.1)	34 (32.4)	38 (36.2)	8 (7.6)
I don't have support from school administrators and staff	2.9 ± 1.1 <sup>xyz</sup>	11 (10.5)	21 (20.0)	45 (42.9)	19 (18.1)	9 (8.6)

Five-point Likert Scale: 1 = Strongly disagree; 3 = Neither agree nor disagree; 5 = Strongly agree

SD = Standard Deviation

<sup>a</sup>Based on 97 respondents who indicated that providing employee food allergy training was "difficult" or "very difficult"

<sup>w, x, y, z</sup> Means with different superscripts differ significantly in the repeated measure of MANOVA ( $P < 0.05$ ).

allergy knowledge deficiencies may facilitate the development or revision of training materials to best assist school foodservice operations in safely serving students with food allergies.

Since 40% of the respondents had not provided any employee food allergy training, there was a need to investigate barriers to providing this training. Some barriers identified in this study were similar to those identified in previous studies about Hazard Analysis Critical Control Point (HACCP) implementation in school foodservice, including lack of resources, time constraints, high costs, employee anxiety, lack of assistance for program implementation, high employee turnover, and staff shortages (Giampoli, Sneed, Cluskey et al., 2002; Hwang, Almanza, & Nelson, 2001). The results of this study also showed that respondents' time constraints were primary barriers to training implementation. To address these problems, training should be customized to the school foodservice environment and be conducted at a time that is convenient to the employees. CNPs could also choose to use appropriate state agencies that provide food

allergy training, especially if they feel uncomfortable about delivering training content.

Focus group participants indicated that it was difficult to retrieve all the necessary information about food allergies because "they are not in one place," while respondents only slightly agreed to this statement. Previous research indicated that many school foodservice directors and managers were not aware of the resources offered by the Department of Education, SNA, National Restaurant Association, local health agencies, or extension offices (Hwang et al., 2001). In fact, the federal government (i.e., USDA, FNS), state agencies (i.e., Massachusetts Department of Education), and professional organizations (i.e., National Food Service Management Institute [NFSMI], Food Allergy Research and Education, and American Academy of Asthma and Immunology) have many printed and/or online food allergy management and training materials that are readily available for school food service staff. However, CNPs may not know about these resources (Koerner, 2000). Therefore, these

**Table 6. Logistic Regression of Factors Differentiating Facilities with and without Food Allergy Training during the Past 12 months (n = 340)**

Variables	B	Wald	Exp(B)	95% CI (Lower, Upper)
Constant	-10.98	8.70	0.00	
Credentials	0.37	0.29	1.45	(0.37, 5.65)
Years of school foodservice experience (regardless of position)	0.01	0.01	1.00	(0.90, 1.13)
Years of school foodservice experience (management position)	0.40	0.28	1.00	(0.91, 1.18)
Previous food allergy training received	1.87	6.61 <sup>***</sup>	6.48	(1.56, 26.95)
Previous food allergic reaction happened in the school cafeteria	0.34	0.16	1.41	(0.26, 7.52)
Food allergy knowledge scores	1.21	4.50 <sup>**</sup>	1.24	(1.02, 1.51)
Barriers to providing training	0.29	0.50	1.33	(0.60, 2.96)
-2 log Likelihood	78.00			
Model $\chi^2$			22.51	
Nagelkerke $R^2$			0.34	

CI = Confidence Interval

<sup>\*\*\*</sup>  $P < 0.001$

<sup>\*\*</sup>  $P < 0.01$

organizations need to reach out to the CNPs to familiarize them with the educational materials developed by them; this could enable school food service personnel to benefit from available resources.

Results of logistic regression indicate that participants who have received food allergy training and those who demonstrated higher food allergy knowledge were more likely to provide food allergy training in their facilities during the past 12 months. This could be explained by previous engagement with and greater awareness about the importance of food allergy training (Walker, Stanton, Kazi, Salmon, & Jenkins; 2009). Moreover, those who are more knowledgeable about food allergies would be more confident about discussing these matters with their employees (Manojlovich, 2005a, 2005b); Counter intuitively, previous food allergy reactions did not influence the decisions to implement food allergy training. This may be due to the low incidence of food allergic reactions reported in school foodservice operations.

### CONCLUSION AND APPLICATION

Food allergies will continue to be a growing concern for all professionals involved in the continuum of food. The SNA's Back to School Trends Report reiterated that all schools have registered an increase in the number of requests for special diets (SNA, 2010). Therefore, it can be concluded that CNPs who administer programs that directly serve children should possess the unique and necessary knowledge and leadership acumen to effectively decrease food allergy risks in the school environment.

One way to minimize the potential risks present in school foodservice operations is through education and professional preparation of CNPs and foodservice employees (Mincher et al., 2012). Mincher (2010) showed that leaders of CNPs play a decisive role in designing, planning, and/or executing policies in school cafeterias to promote good health among students and in implementing training for foodservice employees. The CNPs provide leadership in the form of awareness and education at schools through training. The *Competencies, Knowledge, and Skill Statements for District School Nutrition Directors/Supervisors* published by the NFSMI identified 13 competencies that school nutrition directors/supervisors should possess to perform their daily jobs (Cater & Carr, 2002); six of these are training-related competencies. Possessing this extensive list of competencies is required to ensure the success of training programs.

This study found that a majority of the CNPs learned about food allergies through their daily work or self-study, yet most of them also served as training provider for their employees despite their lack of confidence. Several participants in the focus group study also expressed preference to have "individuals with credentials" to conduct such training. Hence, the CNPs may need guidance to develop more skills in food allergy management and conduct training.

In addition, the results indicated that food allergy training in school foodservice operations is lacking primarily due to time restraints. Future studies should address the frequency and duration of food allergy training programs and explore practical options for necessary training. The financial costs of food allergy training should be further explored to enable the allocation of adequate resources. The training delivery methods (e.g., videos, printed materials, role-play) could also be explored to identify which method is more cost-effective and highly flexible to fit in the hectic schedules of the CNPs and school foodservice employees.

This research supports the previous literature in recognizing RDs' food allergy knowledge and their unique potential to complement the

school environment (Koerner, 2000). This study also found food allergy knowledge level differed based on school district size. Since all schools across the nation have reported an increased in food allergy cases (SNA, 2010), there is a need for the CNPs to be trained in food allergy despite their credential status and school size. Approximately 73% of the participants were ServSafe® certified and 40% were Certified School Nutrition Specialist, both of these certificates or programs could include more extensive food allergy-related topics to reach more audiences.

The study has the following limitations. One limitation is related to the single-mode of survey administration. The survey was only administered online and yielded a response rate of 24%. Previous research by Sullivan, Harper, and Charles (2002). found that some food service managers do not have access to the Internet; therefore, they do not respond to online surveys. Furthermore, Dillman (2000) addressed that the complexity of online survey tools and limited computer accessibility may negatively influence online survey participation. In the school foodservice setting, some CNPs spend a majority of their time directly within the operation (Conklin & Nettles, 1994) rather than performing office-related administrative tasks. Therefore, it is difficult to obtain information from those CNPs who do not have online access.

The second limitation was the timing of the survey. The survey was distributed during the announcement of the new federal child nutrition new meal pattern guidelines. Therefore, CNPs might not have had adequate time to respond to this survey. Researchers received multiple emails from CNPs who were unable to participate in this survey due to time restraints; however, they did not want to provide comments about food allergy issues. Another limitation of this study was that the CNPs who chose to participate in this survey might already have been concerned about food allergies, thereby demonstrating higher food allergy knowledge scores than non-respondents. This is further validated by the greater proportion of CNPs who provided food allergy training in this study (60%) than those in the 2011 School Nutrition Association Operations Report (41.2%) (SNA, 2011).

### REFERENCES

- Asthma and Allergies Foundation of America. (2013). *American with Disabilities Act*. Retrieved from <http://www.aafa.org/display.cfm?id=9&sub=19&cont=255>.
- Carlisle, S. K., Vargas, P. A., Noone, S., Steele, P., Sicherer, S.H., Burks, A. W., & Jones, S. (2010). Food allergy (FA) education for school nurses: A needs assessment survey. *Journal of School Nursing, 26*, 360-367.
- Cater, J., & Carr, D. (2004). *Competencies, knowledge and skills of effective school nutrition managers*. Retrieved from <http://nfsmi-web01.nfsmi.olemiss.edu/documentLibraryFiles/PDF%5C20080222025936.pdf>
- Centers for Disease Control and Prevention: Food allergies on the rise in American children, 3 million affected. (2008, October 22). *Fox News*. Retrieved from <http://www.foxnews.com/story/0,2933,442935,00.html>
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of test. *Psychometrika, 16*, 297-334.
- Dillman, D. A. (2000). *Mail and internet surveys: The tailored design method*. New York, NY: John Wiley & Son, Inc.
- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2007). *Internet, mail, and mixed-mode surveys: The tailored design method*. Hoboken, NJ: John Wiley & Son, Inc.
- Food Allergy Research & Education. (2013). Food Allergens. Retrieved from <http://www.foodallergy.org/section/common-food-allergens1>.
- Giampoli, J., Sneed, J., Cluskey, M., & Koenig, H. F. (2001). School food service director's attitudes and perceived challenges to implementing food safety and HACCP programs. *Journal of Child Nutrition and Management, 2*. Retrieved from <http://docs.schoolnutrition.org/newsroom/jcnm/02spring/giampaoli1/>

- Gupta, R. S., Springston, E. E., Warriar, M. R., Smith, B., Kumar, R., Pongracic, J., & Holl, J. L. (2011). The prevalence, severity, and distribution of childhood food allergy in the United States. *Pediatrics*, *128*, 2011-0204.
- Hennink, M., Hutter, I., & Bailey, A. (2011). *Focus group discussions*. Thousand Oaks, CA: SAGE Publications Inc.
- Hwang, J. H., Almanza, B., & Nelson, D. (2001). Factors influencing Indiana school food service directors/managers' plan to implement Hazard Analysis Critical Control Point (HACCP) program. *Journal of Child Nutrition & Management*, *25*, 24-29.
- Koerner, B. L. (2000). Dietitians face the challenge of food allergies. *Journal of the American Dietetic Association*, *100*, 13-14.
- Lemons, S. (2004). *The effects of training on the knowledge of school food service employees about food allergies*. Retrieved from ProQuest Digital Dissertations. (AAT 1424528)
- Manojlovich, M. (2005a). Predictors of professional nursing practice behaviors in hospital settings. *Nursing Research*, *54*(1), 41-47.
- Manojlovich, M. (2005b). Promoting nurses' self-efficacy: A leadership strategy to improve practice. *Journal of Nursing Administration*, *35*, 271-278.
- Mincher JL, Symons CW, Thompson A. A comparison of food policy and practice reporting between credentialed and noncredentialed Ohio school foodservice directors. *J Acad Nutr Diet*. 2012;112(12):2035-2041.
- Mincher, J. L. (2010). *An analysis of the impact of the public school district food service director on the development and implementation of food-related policies and practices* (Doctoral dissertation). Retrieved from ProQuest Databased. (AAT 3424638)
- Molaison, E. F., & Nettles, M. F. (2010). Special food and nutrition needs in school nutrition programs. *Journal of Child Nutrition and Management*, *34*(1). Retrieved from <http://www.schoolnutrition.org/Content.aspx?id=14037>
- Munoz-Furlong, A., & Weiss, C. (2009). Characteristics of food allergic patients put them at risk for a fatal anaphylactic episode. *Current Allergy and Asthma Reports*, *9*, 57-63.
- National Institute of Allergy and Infectious Diseases. (2010). *What is an allergic reaction to food?* Retrieved from <http://www.niaid.nih.gov/topics/foodallergy/understanding/Pages/whatIsIt.aspx>
- National Institutes of Health, National Institute of Child Health and Human Development. (2000). *How do children spend their time? Children's activities, school achievement, and well-being*. Retrieved from [http://www.nichd.nih.gov/publications/pubs/upload/ti\\_11.pdf](http://www.nichd.nih.gov/publications/pubs/upload/ti_11.pdf)
- Nowak-Wegryn, A., Conover-Walker, M. K., & Wood, R. A. (2001). Food-allergic reactions in schools and preschools. *Archive of Pediatric and Adolescent Medicine*, *155*, 790-795.
- Pulcini, J. M., Marshall, G. D., & Naveed, A. (2011). *Presence of food allergy emergency action plans in Mississippi*. *Annals of Allergy, Asthma and Immunology*, *107*, 127-132.
- Pratt, P., Bednar, C., & Kwon, J. (2012). School nutrition directors' perception of technology use in school nutrition programs. *Journal of Child Nutrition & Management*, *36*(2). Retrieved from <http://www.schoolnutrition.org/Content.aspx?id=18047>
- Rushing, K., Nettles, M. F., & Johnson, J. T. (2009). Operational issues encountered by school nutrition directors in school districts with less than 30,000 student enrollment. *Journal of Child Nutrition & Management*, *33*(2). Retrieved from <http://www.schoolnutrition.org/Content.aspx?id=13213>
- Rushing, K., Nettles, M. F., & Johnson, J. T. (2009). Characteristics and qualities needed for success by school nutrition directors. *Journal of Child Nutrition & Management*, *33*(2). Retrieved from <http://www.schoolnutrition.org/Content.aspx?id=13244>
- School Nutrition Association. (2010). *2010 Back to school trends report*. National Harbor, MD: School Nutrition Association.
- School Nutrition Association. (2011). *School Nutrition operation report: The state of school nutrition 2011*. National Harbor, MD: School Nutrition Association.
- Sicherer, S. H., Furlong, T. J., DeSimone, J., & Sampson, H. A. (2001). The US peanut and tree nut allergy registry: Characteristics of reactions in schools and day care. *Journal of Pediatric*, *138*, 560-565.
- Sullivan, K., Harper, M., & Charles, K. W. (2002). Training needs of school food service site managers. *Journal of Child Nutrition and Management*, *26*(1). Retrieved from <http://docs.schoolnutrition.org/newsroom/jcnm/02spring/>
- United States Department of Agriculture, Food and Nutrition Service. (2013). *Accommodating student with special dietary needs in the School Nutrition Programs*. Retrieved from [http://www.fns.usda.gov/cnd/guidance/special\\_dietary\\_needs.pdf](http://www.fns.usda.gov/cnd/guidance/special_dietary_needs.pdf)
- United States Department of Agriculture. (2012). *Food Distribution Programs*. Retrieved from <http://www.fns.usda.gov/fdd/contacts/fnsro-contacts.htm>
- Verduin, L., & Corbett, A. (2009). Survey of U.S. school personnel on food allergy management and prevention practices [abstract]. *Journal of Allergy and Clinical Immunology*, *123*(Supp), S76.
- Walker, G. H., Stanton, N. A., Kazi, T. A., Salmon, P. M., & Jenkins, D. P. (2009). Does advanced driver training improve situational awareness? *Applied Ergonomics*, *40*, 678-687.
- Youn, S., & Sneed, J. (2003). Implementation of HACCP and prerequisite programs in school food service. *Journal of the American Dietetic Association*, *103*, 55-60.
- Young, M. C., Munoz-Furlong, A., & Sicherer, S. H. (2009). Management of food allergies in schools: A perspective for allergists. *Journal of Allergy and Clinical Immunology*, *124*, 175-182.
- Yunginger, J. W., Squillace, D. L., Richard, B. A., Jones, R. T., & Helm, R. M. (1989). Fatal anaphylaxis reactions induced by peanuts. *Allergy and Asth*