

# Benefits and Barriers to Following HACCP-based Food Safety Programs in Childcare Centers

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## SUMMARY

Before HACCP can be implemented in childcare centers, it is important to identify existing prerequisite programs and implementation barriers. Studying the food safety beliefs and perceptions of directors and foodservice employees in childcare centers is the first step in the process. On the basis of reviewing previous Health Belief Model and food safety research, an instrument was developed that focused on childcare centers, the children at the childcare centers, and HACCP-based food safety behaviors. The population for this study included childcare centers directors and foodservice employees in six Midwestern states.

Overall, respondents agreed that they could follow HACCP-based programs; however, foodservice employees indicated more confidence in their abilities than did directors. The least implemented prerequisite programs were those related to equipment maintenance, food safety training, and kitchen operation procedures. For all nine prerequisite programs, significant differences based on certification status were found. It appears that childcare centers could easily adapt existing programs to follow a HACCP-based food safety program, but additional food safety training is needed. Future research conducted with directors and employees of childcare centers should assess knowledge levels and attitudes about HACCP-based food safety programs.

## INTRODUCTION

Regulatory authorities define childcare centers as licensed facilities that provide childcare services to pre-school age children. Children attending childcare centers are at a higher risk for contracting foodborne illnesses because of their less developed immune systems, their lower weight, and the possibility of being exposed to pathogens transmitted by secondary sources (3, 30).

Between 1990 and 2004 in the United States, 43 foodborne illness outbreaks affecting 1,276 children in childcare centers were confirmed (6). Childcare attendance has been associated with a number of infections and outbreaks. Reeves et al. (20) found that fecal colonization of a strain of *E. coli* was higher among children in childcare (30%) than among control children (6%) or medical students (8%). Stroup and Thacker (28) proposed increased surveillance of childcare centers because children had diarrheal incidents 1.6 to 3.5 times greater than those who were cared for in their homes. Wilde, Van, Pickering, Eiden, and Yolken (31) stated that rotaviruses are rampant in day care facilities during diarrheal outbreaks.

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Hedberg and Osterholm (12) reported that Norwalk-like viruses (rotaviruses, caliciviruses, and astroviruses) had become the most common cause of viral gastroenteritis outbreaks in young children. Matson (15) identified the following factors related to the spread of viral gastroenteritis in childcare centers: (1) the high infectious rate of viruses, (2) the fact that infections occur most often during outbreaks, and (3) the more common occurrence of asymptomatic infections than of symptomatic infections (15).

Tucker, Haddix, Bresee, Holman, Parashar, and Glass (29) reported that nearly 1.5 million doctor visits, 200,000 hospitalizations, and 300 deaths of children per year were caused by acute gastroenteritis and almost one third of all hospitalizations of children less than five years old are for rotavirus diarrhea. Foodborne disease costs in direct medical care for these children are almost \$250 million per year, with an additional societal cost estimated at \$1 billion per year (29).

In 2004, CDC (4) reported confirmed cases of *Shigella sonnei* in six states: Virginia (876), Maryland (250, plus one death), New Jersey (254), South Carolina (95), Delaware (200), and North Carolina (935). High proportions of these outbreaks were associated with daycare attendance (4). These reports illustrate the importance of implementation of a food safety system in childcare centers. Researchers have recognized HACCP as an effective, proactive food safety system that had decreased the occurrence of foodborne illness outbreaks since USDA and FDA mandated its implementation in processing industries (5, 16).

Food safety prerequisite policies and programs are the foundation of the development and implementation of HACCP. Examples of prerequisite programs include personal hygiene, cleaning and sanitation, pest control, and food safety training. Without these prerequisite programs in place, the successful implementation of a HACCP-based food safety program is uncertain (16). However, understanding the barriers to implementation can be just as critical.

Several researchers have investigated barriers to implementing HACCP in different sectors of the foodservice industry. In Iowa retail operations, Roberts and Sneed (23) found that of 13 barriers to

prerequisite and HACCP implementation, the greatest ones included employee training and employee motivation, managers' time to implement programs, costs associated with food safety and employees' taking time to follow food safety practices. In a follow-up study, Roberts, Barrett, and Sneed (22) found that sanitarians in Iowa and Kansas identified the greatest barriers as employee knowledge and time. Riggins, Roberts, and Barrett (21) indicated that employee training (77%), employee motivation (70%), and time for managers to monitor activities (63%) were the barriers identified by managers in college and university foodservices.

In school foodservice, Hwang, Almanza, and Nelson (14) found that of 162 school foodservice managers surveyed, 22 (14%) had implemented HACCP programs. Of those who did not have a HACCP program, 28% had plans to implement HACCP in the future. The majority (69%) either did not know what a HACCP program was, or had no plans to implement HACCP. Other researchers (10, 11, 25, 33) who have examined barriers to HACCP implementation in school foodservice have reported time as the greatest barrier to prerequisite and HACCP program implementation.

The Child Nutrition Program (7, 8) mandated HACCP-based food safety programs for schools; however, there are no such requirements for childcare centers. The National Resource Center for Health and Safety in Child Care (19) publishes standards for health and safety in childcare centers. Analogous to the Child and Adult Food Program regulations (7, 8) the standards require that state and local food safety laws and regulations be followed (1).

Before implementation of HACCP in childcare centers, it is important to identify existing prerequisite programs and the barriers to implementation. Studying the food safety beliefs and perceptions of directors and foodservice employees in childcare centers is the first step in the process.

The Health Belief Model (HBM) developed by Rosenstock (24) has been used successfully in previous studies to identify preventative health behaviors and was therefore judged to be appropriate for use in the current study. Additionally, the HBM has been used in food safety research (10, 11, 25).

The primary purposes of this research were to determine beliefs and perceptions of directors and foodservice employees about benefits, barriers, and intentions to follow HACCP-based food safety programs and to examine differences based on employment status, educational level, and food safety certification. Additionally, this study sought to determine the status of prerequisite programs in childcare centers and to identify differences in prerequisite program status based on certification status.

## METHODOLOGY

### Instrument development

Following a review of previous belief and perception questionnaires used in HBM and food safety research (10, 11, 25, 32), an instrument was developed specifically for childcare centers to determine beliefs and perceptions about HACCP-based food safety programs. Items which focused on either the childcare center, the children at the childcare center, or HACCP-based food safety programs, measured perceived susceptibility, severity, benefits, barriers, self-efficacy and behavioral intentions to follow a HACCP-based food safety program. The instrument had three parts and was available in both paper and electronic formats.

Part I of the questionnaire contained 33 items. Six items measured perceived susceptibility and focused on either the center or on children becoming ill from a foodborne disease. Perceived severity (8 items) focused on the severity of consequences to either the center or the children in the event of a foodborne disease. On the basis of previous research from other segments of the foodservice industry, perceptions of benefits and barriers were measured with 4 and 9 items, respectively (10, 26, 27). Self-efficacy items ( $n = 3$ ) were worded to assess general agreement about confidence, skills, and knowledge related to following HACCP-based food safety programs. Three items measured behavioral intention and asked about plans to follow HACCP-based food safety programs in the future. Statements were measured on a five-point Likert scale (one being strongly disagree to five being strongly agree).

Part II requested information about prerequisite program implementation.

Because childcare personnel did not know or use the term “standard operating procedures,” the term “kitchen operating procedures” was substituted.

Part III obtained demographic information about the respondents and the facilities.

The questionnaire and research protocol were reviewed and approved by the Human Subjects Committee for the Institutional Review Board (Kansas State University, Manhattan).

## Population and sample

The population for this study included childcare center directors and foodservice employees who were members of the National Association for the Education of Young Children (NAEYC) (17, 18). To be included in the study, the center had to be located in one of six Midwestern states and provide lunch to children participating in full-day care. The final sample included 528 centers in Colorado (122), Iowa (99), Kansas (64), Missouri (100), Nebraska (58), and Oklahoma (80).

## Pilot test

Childcare facilities ( $n = 20$ ) were randomly selected from the sample database and contacted to review the instrument. Additional questions asked about content and clarity of the subject matter as well as its applicability to childcare centers. Minor wording changes to HACCP definitions were made based on pilot participant ( $n = 8$ ) recommendations.

A focus group ( $n = 7$ ) and a committee ( $n = 5$ ) of food safety, HACCP, and child care experts confirmed content validity.

## Data collection

Two cover letters explaining the objectives of the research (one each for the director and foodservice employee), two copies of the instrument, and a postage-paid, coded return envelope were mailed to participants. The cover letters and paper instruments included the website address for those participants who might prefer to complete the survey electronically. Dillman (9) suggests that higher response rates may be attained if instruments are available in multiple formats. Reminder postcards were sent two

and five weeks after the initial mailing to encourage participation.

## Data analysis

All data analysis procedures used the Statistical Package for Social Sciences (SPSS) (version 12.0, 2003, SPSS, Inc., Chicago: IL). Descriptive statistics computed were frequencies, means, and standard deviations. Independent samples  $t$ -tests were used to determine the statistical significance of differences in item mean scores based on position title, location, level of education, and food safety certification. Chi-square tests were used to determine proportional differences for categorical data. An alpha level of .05 was set as the level of significance.

## RESULTS

A total of 28 survey packages were returned as undeliverable, reducing the number of facilities in the sample population to 500. An overall facility response rate of 17.2% ( $n = 86$ ) was obtained. Based on the assumption that only half the centers would have a designated foodservice employee, the sample population was estimated at 750 (500 facilities multiplied by 1.5 staff members). Because of incomplete and missing data, the final overall response rate was 17.5% ( $n = 131$ ).

## Demographics

Demographics indicated that most of the respondents were employed as directors ( $n = 78$ ), were female (95.4%), and reported being between 40 and 49 years of age (26.7%,  $\mu = 43$ ). The majority of directors had a bachelor's degree (45.9%) and most of foodservice employees, a high school diploma (35.7%). The largest proportion (43.7%) of facilities were located in areas with populations over 50,000, and 60.9% received reimbursement from the Child and Adult Care Food Program.

## Item responses

Overall responses to individual questionnaire items are shown in Table 1. Analyses were conducted to determine differences based on position title, location, level of education, and food safety certification.

Significant differences were found for the statement “if children develop food-

borne illness, it could be more serious than other diseases” ( $t = -1.67$ ,  $P = 0.05$ ) and “following a HACCP program reduces food safety problems” ( $t = 1.74$ ,  $P = .04$ ), with directors rating the items higher. Other significant item differences were the benefit of using food safety checklists ( $t = 2.46$ ,  $P = 0.01$ ), the lack of funding for additional food safety training ( $t = 1.98$ ,  $P = 0.03$ ), the time that would be required to complete additional paperwork ( $t = 1.90$ ,  $P = 0.03$ ), and the development of new skills ( $t = 2.08$ ,  $P = 0.02$ ). For these items, foodservice employees had higher mean scores. Foodservice employees also indicated having higher levels of confidence ( $t = 2.23$ ,  $P = 0.01$ ) and skills necessary ( $t = 2.69$ ,  $P = .004$ ) to follow a HACCP-based food safety program.

For perceived susceptibility of children to foodborne illness, a significant difference was found for the item “Within the next year, the children at my Center will get a foodborne illness” ( $t = 2.61$ ,  $P = .01$ ); those with more education had higher mean scores.

Three items measuring perceived severity had significant differences, and related to job endangerment in the event of a foodborne illness ( $t = -2.29$ ,  $P = .02$ ) and the severity of consequences to children from foodborne illnesses ( $t = -2.30$ ,  $P = .02$ ), respondents with less education had higher mean scores. Conversely, for the item stating that foodborne illnesses were more serious than other diseases for children ( $t = 2.90$ ,  $P = .00$ ), those with higher levels of education had higher mean scores.

For items measuring perceived benefits and perceived barriers, respondents with less education had higher mean scores for four items: certification increasing safe food handling practices ( $t = -2.28$ ,  $P = .02$ ), HACCP being important to maintain food safety effectively ( $t = -2.42$ ,  $P = .02$ ), time for additional paperwork required by HACCP ( $t = -2.85$ ,  $P = .01$ ), and the difficulty of developing new habits ( $t = -2.61$ ,  $P = .01$ ). For self-efficacy, those with less education had higher mean scores for confidence to follow a HACCP-based program ( $t = -2.83$ ,  $P = .01$ ) and needing to learn more to follow the program ( $t = -2.01$ ,  $P = .05$ ). There were no differences for behavioral intentions.

Analysis of differences in beliefs and perceptions between those who reported

**TABLE I. Overall responses to items (n = 131)**

Construct <sup>a</sup>	Statement <sup>b, c</sup>	M	SD
Perceived Susceptibility	A child has an increased chance of having complications that come from getting a foodborne illness.	3.95	0.79
	When I think about a foodborne illness occurring at my center, I feel concerned.	3.83	1.26
	Children, in general, have a greater chance of getting a foodborne illness than adults.	3.67	1.03
	I worry a lot about some of the children at my center getting a foodborne illness.	1.99	1.02
	Within the next year, the children at my center will get a foodborne illness.	1.66	0.76
Perceived Severity	The chances of children at my center getting a foodborne illness are great.	1.62	0.81
	A foodborne illness could cause severe consequences for young children.	4.32	0.67
	Problems children would experience from a foodborne illness could last a long time.	3.81	1.03
	I am afraid to even think about the possibility of a foodborne illness outbreak at my center.	3.41	1.26
	If children acquire a foodborne illness, their whole life could change.	3.35	0.98
	If the children developed a foodborne illness, it could be more serious than other diseases.	3.22	0.94
Perceived Benefits	The center's financial security would be in jeopardy if any child got a foodborne illness.	2.92	1.10
	A foodborne illness outbreak would endanger the relationship I have with my fellow employees.	2.82	1.16
	If the children at my center contracted a foodborne illness, my job would be endangered.	2.66	1.12
	Employees with food safety certification are more likely to use safe food handling practices.	4.17	0.76
Perceived Benefits	Food safety checklists may locate a problem before it is discovered by regular health inspections.	4.17	0.60
	A HACCP-based food safety program is important for maintaining food safety effectively.	4.06	0.77
Perceived Barriers	Following a HACCP-based food safety program at work would greatly reduce future food safety problems for me.	3.82	0.93
	We lack the time required to train employees properly in food safety. <sup>d</sup>	4.05	0.97
	We do not have the resources to improve food safety at my center.	4.02	1.00
	Foodservice employees lack training in food safety issues. <sup>d</sup>	3.71	1.06
	I would be less anxious about foodborne illness if I followed a HACCP-based food safety program. <sup>d</sup>	3.65	0.92
	We lack the funding to pay for additional food safety training. <sup>d</sup>	3.61	1.29
	We do not have the time for the additional paperwork a HACCP-based food safety program would require. <sup>d</sup>	3.47	1.13
	Staff and employees of childcare centers do not feel comfortable with change. <sup>d</sup>	3.33	1.11
	Completing HACCP-based food safety program requirements would involve developing new habits, which is difficult. <sup>d</sup>	3.30	1.06
	Other than myself, center employees do not care about food safety issues. <sup>d</sup>	1.91	1.00
Self-efficacy	I am confident that I can follow a HACCP-based food safety program.	4.06	0.71
	I have the skills necessary to follow a HACCP-based food safety program.	3.88	0.89
	I need to learn more to be able to follow a HACCP-based food safety program.	2.57	1.07
Behavioral Intentions	I would not use a food safety self-inspection form unless mandated.	3.77	0.94
	I would follow a voluntary HACCP-based food safety program.	3.77	0.81
	I would use recipes modified for HACCP-based food safety programs.	3.54	0.86

<sup>a</sup> Construct Names.

<sup>b</sup> All statements were preceded by the instructions to "Circle the response that corresponds to the way you feel about each statement. There is no right or wrong answers, please be honest."

<sup>c</sup> All statements were measured on a 5-point Likert scale with 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

<sup>d</sup> Item reverse scored.

**TABLE 2. Overall prerequisite program implementation status based on facility (n = 86)**

Program <sup>a</sup>	Completely <sup>b</sup>		Partially <sup>b</sup>		Not <sup>b</sup>		No Response	
	n	%	n	%	n	%	n	%
Personal Hygiene	82	94.3	3	3.4	0	0.0	2	2.3
Pest Control Program	76	87.4	5	5.7	5	5.7	1	1.1
Chemical Storage	79	90.8	3	3.4	4	4.6	1	1.1
Purchasing Procedures	74	85.1	10	11.5	2	2.3	1	1.1
Food Allergy Procedures	76	87.4	9	10.3	1	1.1	1	1.1
Equip Cleaning Procedures	70	80.5	15	17.2	1	1.1	1	1.1
Kitchen Operation Policies	70	80.5	10	11.5	5	5.7	2	2.3
Food Safety Training Program	65	74.7	17	19.5	3	3.4	2	2.3
Equip Maintenance Program	53	60.9	25	28.7	7	8.0	2	2.3

<sup>a</sup> Percentages may not add to 100% due to rounding.

<sup>b</sup> As reported by one respondent per facility. Director responses were used when possible.

having food safety certification and those reporting no certification indicated that for every significant difference noted, certified respondents had the higher mean score. Significant differences were seen for 52% of the items in the questionnaire.

### Prerequisite program implementation status

Participants indicated the implementation status of nine prerequisite programs by specifying “Not Implemented”, “Partially Implemented”, or “Completely Implemented” (Table 2). Frequency distributions indicated that most prerequisite programs were fully or partially implemented. The programs implemented by the largest number of childcare centers were personal hygiene (94.3%), pest control (87.4%), and chemical storage (90.8%). The least often implemented prerequisite programs were kitchen operations procedures (80.5%), food safety training (74.7%), and equipment maintenance (60.9%).

There were significant differences in those who reported complete implementation of each of the nine prerequisite programs based on reported certification status in food safety. Respondents with

food safety certification had higher rates of implementation (Table 3).

## DISCUSSION

This research determined beliefs and perceptions of childcare center directors and foodservice employees about benefits, barriers, and intentions to follow HACCP-based food safety programs. The low response rate may be due to several factors, including lack of an internet connection or difficulty accessing the instrument. Other possible reasons are that the sample population did not have time, did not consider the topic important, and/or were not knowledgeable about HACCP-based food safety programs.

Overall, respondents agreed that children were vulnerable to foodborne diseases and that consequences for children could be severe, but they believed that a foodborne disease would not occur at their center and, if it did, there would be no consequences to themselves or the center.

Pertaining to barriers, respondents indicated that they lacked time for proper employee training, resources to improve food safety, and funding to pay for train-

ing. These results are consistent with results of other research (10, 14, 21, 22, 23, 27, 33), which also found that time, money, resources, and training were barriers to implementing prerequisite and HACCP-based food safety programs.

Respondents agreed that they could follow a HACCP-based food safety program; however, foodservice employees indicated more confidence in their abilities than did directors. This is an expected finding, because employees should perceive themselves as more confident, since directors may lack the practical foodservice experience necessary for estimating performance requirements accurately.

Other differences in beliefs and perceptions found between directors and foodservice employees included the stronger agreement of directors than of foodservice employees that a foodborne disease would be serious, which may reflect their accountability as directors. Foodservice employees agreed more strongly than did directors that a lack of time and funding for training were barriers. Foodservice employees indicated the need for additional food safety training; however, because of budget constraints, directors may be reluctant to allow additional training except for that required by accrediting agencies or health departments.

Differences based on level of education indicated that those with more education were more likely to agree that foodborne illnesses were more serious than other diseases for children, although respondents with less education agreed that the consequences of foodborne illnesses for children are severe. For eight of the nine barrier items, those respondents with less education had higher mean scores than those with more education; one item had nearly identical mean scores (3.62 and 3.63). The one item with nearly identical scores stated “I would be less anxious about foodborne illness if I followed a HACCP-based food safety program.” These results indicate that less educated directors and foodservice employees perceive more barriers to implementation of HACCP-based programs than do those with higher levels of education. Interestingly, those with less education also indicated more confidence in being able to follow a HACCP-program and had less disagreement about needing to learn more about HACCP-programs.

**TABLE 3. Implementation of prerequisite programs by certification status of all respondents**

Program <sup>a</sup>	Certified <sup>c</sup>		Not Certified <sup>c</sup>		—	Sig.
	n <sup>b</sup>	%	n <sup>b</sup>	%		
Personal Hygiene	42	0.98	79	0.95	13.45	0.00*
Pest Control Program	38	0.88	78	0.94	15.54	0.00*
Chemical Storage	41	0.95	79	0.95	13.67	0.00*
Purchasing Procedures	38	0.88	73	0.88	12.67	0.00*
Food Allergy Procedures	41	0.95	71	0.86	9.47	0.00*
Equipment Cleaning Procedures	36	0.84	71	0.86	13.13	0.00*
Kitchen Operation Policies	39	0.91	66	0.80	8.33	0.00*
Food Safety Training Programs	34	0.79	64	0.77	10.78	0.00*
Equipment Maintenance Program	31	0.72	52	0.63	6.79	0.01*

<sup>a</sup> Percentages may not add to 100% due to non-response.

<sup>b</sup> Completely implemented program.

<sup>c</sup> As reported by respondents.

\* P-value < .05.

Significant differences were found in beliefs and perceptions about HACCP-based food safety programs on the basis of food safety certification status. In all cases, those with certification had the higher mean scores, which would indicate that those with food safety certification have a greater understanding of the importance of food safety and of implementing a HACCP-based food safety program. All groups agreed that time for additional HACCP paperwork was a barrier to implementing HACCP-based programs.

### Implementation differences

Most centers in this study had implemented personal hygiene policies (94.3%) and policies covering chemical storage (90%), which are among the policies required for accreditation through the NAEYC (17, 18). The least implemented prerequisite programs were kitchen operation procedures and food safety training. These programs are essential for safe food preparation; however, size of operation and numbers fed may influence implementation. Because the largest number of respondents indicated that they fed fewer than 50 children, directors and foodservice employees may not consider these programs important.

However, food safety certification significantly impacted implementation. Those who were certified had implemented all nine programs. This finding is consistent with previous research that has indicated that food safety certification has an impact on program implementation (23).

### CONCLUSIONS AND APPLICATIONS

Results of this study are consistent with findings of previous research. It appears that noncommercial foodservices, regardless of segment, report the same barriers to implementing prerequisite and HACCP-based food safety programs: time, money, resources, and training (2, 13, 14, 15, 21, 23, 27, 33). Overall, respondents agreed about the importance of these barriers, regardless of level of education or certification status.

Most respondents had partially or fully implemented the prerequisite programs. It appears that childcare centers could easily adapt existing programs to include requirements for the implementation of HACCP-based food safety programs. Written procedures for kitchen operations and food safety training were implemented least often and should be

addressed. The lower implementation rate of these programs reinforces the findings of this study that directors were not as concerned about food safety training as the foodservice employees. However, those with food safety certification had implemented the nine programs, which would indicate that certification does have an impact on childcare center food safety.

Respondents generally disagreed that they needed to learn more to follow a HACCP-based food safety program; however, the number of neutral responses may indicate a lack of knowledge in this population. For HACCP implementation, childcare center directors may need more education on food safety practices. Future research conducted with childcare center directors and employees should include determining knowledge levels of and attitudes toward HACCP-based food safety programs. Focus groups and individual interviews could be used to determine requirements for integrating a HACCP-based food safety program into existing programs. Because of the highly susceptible population served, childcare centers should be concerned about the safety of the food prepared and implement the best possible systems to ensure that no child becomes ill from a foodborne disease.

Results of this research indicate the need to develop food safety and training materials specifically for childcare centers. Additionally, as the majority of respondents indicated that they prepared meals using convenience foods instead of cooking from “scratch,” a model HACCP program should be developed considering this and other factors characteristic of childcare.

These findings are useful to regulatory and accrediting agencies. As previously mentioned, The Child Nutrition Program (7, 8) mandated HACCP-based food safety programs for school foodservice operations. However, even though childcare also receives this funding, there are no requirements for HACCP-based food safety programs in childcare centers. Childcare facilities serve a higher-risk population than do school foodservices, yet food safety issues do not appear to be a concern. Training in food safety is scanty and HACCP is not a requirement for licensing. Federal agencies should revise current regulations governing childcare centers, and state agencies should emphasize food safety in childcare centers

and perform inspections similar to those at other, non-commercial, operations. Because it was significant that those with food safety certification had implemented prerequisite programs, it would be important for accrediting agencies to require nationally recognized food safety certification for foodservice personnel. Additionally, for accreditation purposes, the inclusion of a criterion requiring implementation of a HACCP-based food safety program should be considered.

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