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## Assessing Food Safety Behavior: Salient Beliefs of School Nutrition Employees

### ABSTRACT

Thirty million children are served daily through the National School Lunch Program, and even more students consume a breakfast or snack prepared by employees in school nutrition programs. It is therefore imperative that employees prepare and serve food safely. To motivate these behaviors, intervention strategies must target employee beliefs about food safety practices. The purpose of this elicitation study was to determine significant variables that can influence behavioral intention by using the Theory of Planned Behavior to investigate child nutrition program employees' salient beliefs regarding proper handwashing, handling of food and work surfaces, and use of thermometers in food preparation and service.

Through purposive sampling, 43 school nutrition employees were recruited to participate in four focus groups in three Midwestern states. Employees identified salient beliefs that affect behavior. Three researchers analyzed the transcripts independently to identify themes. Further analysis was conducted, using qualitative data analysis software (NVivo 11).

Employees' behavioral beliefs were related to maintaining health through safe handling of food. Employees felt social pressure from other employees, parents, and students to perform or not perform the behavior. Reported barriers to following the practices were related to the need for more time and adequate access to resources, equipment, and facilities.

### INTRODUCTION

Through the United States Department of Agriculture (USDA) Food and Nutrition Service (FNS), programs such as the National School Lunch Program, School Breakfast Program, and Child and Adult Care Food Program serve almost 5 billion lunches, 2.4 billion breakfasts, and 1.5 billion snacks to K–12 students annually (17–19). Preventing foodborne illness outbreaks in schools is an essential element in protecting the health of children (5). According to the Centers for Disease Control and Prevention (3), foodborne disease outbreaks can be reduced by following food safety practices such as proper handwashing, using a thermometer to check the temperature of food, and proper handling of

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food and work surfaces. However, a challenge for foodservice operators is motivating employees to practice appropriate behaviors. Even though school nutrition programs are required to have a food safety program based on HACCP, previous observational research has reported that food contact surfaces were properly cleaned and sanitized only 78% of the time, temperatures of foods were checked at the completion of cooking only 62% of the time, employees washed their hands properly and when required only 21% of the time (14). These results indicate a need to motivate school nutrition employees to improve their food safety practices and behaviors.

While food safety training increases knowledge related to proper food safety practices, training alone is not sufficient to change behavior (13). The most common factors that restaurant food handlers identified as influencing proper food safety practices were time pressure due to the high volume of food served, management and staff attention to food safety, and problems related to facilities, equipment, and resources (7). To encourage improvements in on-the-job behavior and ensure safe food handling, workplace environments and intervention programs must address these factors so as to achieve an environment that supports proper food safety practices (6–9, 12–14).

According to the Theory of Planned Behavior (TPB), the best predictor of actual behavior is behavioral intention (1). To utilize the TPB to predict and motivate changes in behavioral intention and ultimately behavior, interventions must attempt to change people's beliefs (2). To understand which salient beliefs to target for change, one must explore the underlying reasons for attitudes, perceived social pressures (subjective norms), and perceived ability to perform the behavior (perceived behavioral control) (2). An elicitation study is often used to identify these behavioral, normative, and control beliefs (2). Behavioral beliefs include those related to perceived advantages and disadvantages of performing the behavior and are linked to one's attitude. Normative beliefs are associated with caring about the performance of the behavior and are linked to subjective norms. Control beliefs include opinions regarding barriers and facilitators to performing the behavior and are linked to perceived behavioral control (2). This study used the TPB to identify salient beliefs about food safety behaviors, in an attempt to assist in motivating employee behavior change.

As stated by Green and Selman (7), food safety programs should include more than food safety training if they are to motivate safe food handling behaviors of employees, and the workplace environment must support safe food-handling practices (9). Therefore, the purpose of this elicitation study was to use the TPB framework to investigate child nutrition professionals' salient behavioral, normative, and control beliefs to identify significant variables that can influence behavioral intention related to three food safety practices: proper handwashing, handling of food and work surfaces, and the use of thermometers.

## MATERIALS AND METHODS

Focus groups were conducted to determine behavioral, normative, and control beliefs of child nutrition professionals with regard to three key food safety behaviors. The purpose was to obtain in-depth information about the employees' beliefs regarding proper performance of the food safety practices.

### Sample and recruitment

Participants were recruited from four school districts in three Midwestern states. Purposive sampling was used, with the following eligibility criteria: proximity of the school nutrition program to the research team, current employment in a child nutrition program as a food handler, use of English in speaking, and age 18 years or older. School nutrition directors were contacted by telephone to assist with the recruitment process. Follow-up information, posters, and sign-up documents were sent by email to increase participation. A reminder email was sent to directors the day before each scheduled focus group meetings.

### Data collection tools

A three-section elicitation guide was developed based on research by Ajzen (2). Each section discussed one of the three food safety behaviors of interest: handwashing, handling of food and work surfaces, or thermometer use. Six open-ended questions adapted from Roberts et al. (13) were discussed. Questions asked respondents about each food safety behavior to determine their expectations about positive and negative outcomes of the behavior, positive and negative feelings about the behavior, and conditions facilitating or impeding the performance of the behavior. A single question addressed normative beliefs about all three food safety behaviors in combination. A demographic questionnaire was used to gather information on gender, age, level of education, full-time or part-time status, length of time working in foodservice operations, length of time working in current operation, and food safety certification.

### Data collection

The Institutional Review Board at Kansas State University approved the research protocol, and all participants provided signed informed consent forms. Four face-to-face focus group sessions averaging 40 to 55 minutes in length were conducted and audio recorded, using a digital recorder. Through use of focus groups, different perspectives were gathered, allowing for an in-depth understanding of the constructs. Patton (10) recommended that focus groups include between six and ten participants. For this study, 10 or 11 employees participated in each focus group. A moderator led the focus groups, with the collaboration of an assistant moderator (15), who aided with the logistics, observed, and took notes, using a form developed by the research team. After each session, the moderator and assistant moderator

met for a debriefing session, and additional information was added to the notes as needed.

A moderator's guide was used to ensure consistency for all focus groups. The moderator greeted participants as they arrived, thanked them for joining the discussion, and asked them to complete the consent form and a demographic questionnaire. Each session began with the moderator describing the focus group process and goals. Participants were asked to use pseudonyms for confidentiality and for promoting a safe, inviting environment. Each participant received a copy of the discussion questions and behavior definitions as a reference to use during the focus group meeting. Next, the moderator explained the food safety behaviors, providing detailed descriptions of how each practice is properly performed in the work environment. The respondents were then asked a series of open-ended questions designed to capture participants' beliefs about the practices under the TPB constructs. Participants were encouraged to indicate as many factors as possible for each question. The moderator allowed ample time for responses, and each question was repeated multiple times. Follow-up questions were asked, when needed, to ensure that the moderator and assistant moderator understood the participants' perspectives. The elicitation process continued until saturation was achieved.

#### Data analyses

Demographic information was entered into Microsoft Excel (Version 2013), and descriptive statistics (frequencies, percentages, and means) were calculated. Focus group recordings were transcribed verbatim. Transcripts of focus group responses were pooled for analysis of key TPB themes, using a hybrid deductive and inductive method. Three researchers independently analyzed transcripts through manual, free, and line-by-line coding to generate an initial list of themes, which were categorized by use of the TPB constructs. The researchers subsequently met to validate the themes until agreement was achieved. A theme book was developed to be used in NVivo 11 (QSR International Pty Ltd. Version 11, 2015), a qualitative data analysis software program.

Transcripts were entered into NVivo 11. Analysis was conducted using a template coding method to generate visual representation of the data. Primary nodes were established to represent the three food safety practices. Secondary nodes corresponded to TPB constructs addressed by the salient belief-elicitation questions. Sub-categories of "advantages" and "disadvantages" were established for behavioral beliefs and "facilitators" and "barriers" for control beliefs. Three researchers then independently coded into NVivo the lowest sublevel, using the previously constructed theme book. Interpretation of the coding process was conducted by multiple meetings among the researchers, during which researchers discussed whether

the coding process was conducted line-by-line, by sentence, or by entire paragraphs. Discussions also included descriptions, meanings, and interpretation of the terms in the theme book. After agreement had been reached, themes were finalized. Beliefs were rank ordered, and the most frequently mentioned beliefs were selected as the salient set (2).

#### RESULTS

The four focus groups conducted in three states contained a total of 43 child nutrition professionals from four school districts. A summary of demographic information is provided in *Table 1*. Most of the employees were 40 years or older ( $n = 33$ ), worked full-time ( $n = 33$ ), and had food safety certification ( $n = 29$ ).

Based on data generated by the NVivo analysis, a visual representation of the frequency with which participants referred to these constructs for all three practices is presented in *Fig. 1*. Overall, proper handwashing generated the most quotes ( $n = 183$ ), followed by use of a thermometer to check the temperature of food ( $n = 177$ ) and proper handling of food and work surfaces ( $n = 130$ ).

#### Proper handwashing

The frequency of themes related to behavioral and control beliefs identified by participants for proper handwashing is presented in *Table 2*. Control beliefs ( $n = 102$ ) were referred to more frequently than behavioral beliefs ( $n = 81$ ).

To establish behavioral beliefs, participants were asked to list good and bad things that they believed could result from proper handwashing and reasons employees would want and not want to follow this practice. These advantages and disadvantages of performing the behavior help to determine an individual's attitude toward proper handwashing. Advantages ( $n = 40$ ) and disadvantages ( $n = 41$ ) were mentioned with nearly equal frequency.

Themes that emerged from the category of advantages for proper handwashing included food safety ( $n = 32$ ) and pride ( $n = 8$ ). The theme "food safety" was mentioned in all four focus groups while the theme "pride" was mentioned in three of the four focus groups.

The food safety theme included topics such as preventing the spread of bacteria, preventing cross-contamination, and preventing illness. For instance, an employee stated proper handwashing is good because "you don't spread germs if you wash your hands."

The pride theme included topics such as enjoying clean hands, setting a good example, and sharing knowledge. One employee mentioned enjoying properly washing their hands because it provides "a clear conscience of knowing that your hands are clean; that you're not going to cross-contaminate, spread [germs,] ... [and] knowing you're [following] safe-handling practices."

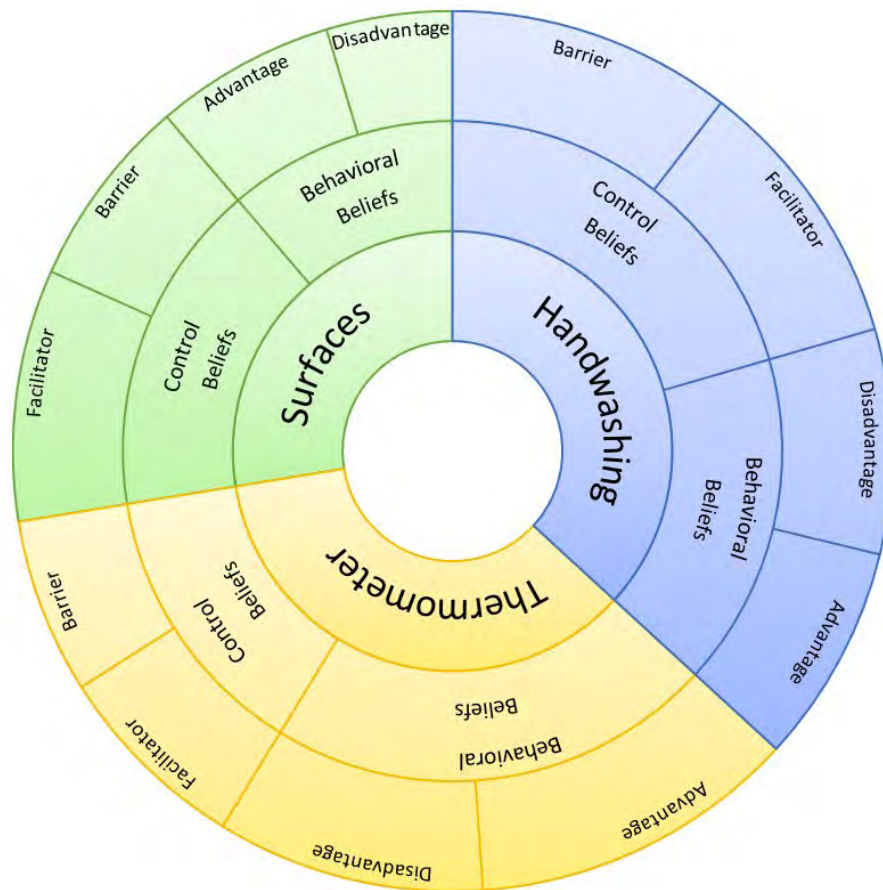


FIGURE 1. Visual representation of frequency of quotes referring to TPB constructs for three food safety practices: proper handwashing, using a thermometer to check the temperature of food, and proper handling of food and work surfaces. Construct size ranges from largest to smallest following a clockwise rotation.

Themes related to disadvantages of proper handwashing included “time consuming,” “dry skin,” “difficulty putting on gloves,” and “waste.” The theme “time consuming” (n = 20), stated in all four focus groups, included topics of being rushed and feeling that tasks will be hard to accomplish if proper handwashing procedures are followed. One employee supported this notion by stating, “We’d never get anything done. We’d be spending all our time at the sink washing our hands.”

The theme “dry skin” (n = 11), which referred to dry, cracked skin that results from proper handwashing, was mentioned in all four focus groups. One employee stated that one disadvantage of washing hands is “very dry skin, very cracked skin. I mean, my hands [feel like they are] a hundred-twelve years old.”

Difficulty putting on gloves (n = 7), was mentioned in three of the four focus groups, included topics like not washing hands between changing gloves and difficulty

getting gloves back on after proper handwashing. One employee stated that a reason for not using proper handwashing techniques is that “you know you’re going to fight with the gloves.” When asked if employees had difficulty putting gloves on wet hands, one employee confirmed, “it’s almost impossible.”

“Waste (n = 3), was noted in two of the four focus groups, and referred to wasting supplies such as towels. Employees mentioned that by properly washing their hands, “you use more paper towels” and “when I wash my hands, I let the water run.”

To establish control beliefs, participants were asked to list things that would make it easier and more difficult to properly wash hands. Identification of these facilitators and barriers to performing the behavior helps to determine an individual’s perceived behavioral control with regard to proper handwashing. Within the control belief construct, facilitators (n = 50) and barriers (n = 52) were mentioned with nearly

**TABLE 1. Characteristics of employees (n = 43)**

Characteristic	n (%) <sup>a</sup>
<i>Age</i>	
29 years or younger	6 (14.0)
30–39 years	4 (9.3)
40–49 years	11 (25.6)
50–59 years	13 (30.2)
60 years or older	9 (20.9)
<i>Gender</i>	
Male	5 (11.6)
Female	38 (88.4)
<i>Education</i>	
High School	20 (46.4)
Some College	19 (44.2)
Bachelor’s Degree	2 (4.7)
Graduate Degree	2 (4.7)
<i>Current Work Status</i>	
Full time	33 (76.7)
Part time	10 (23.3)
<i>Years Employed in Foodservice</i>	
Less than 1	4 (9.3)
1–3	7 (16.3)
4–7	7 (16.3)
8–12	8 (18.6)
13–20	10 (23.3)
20 or more	7 (16.3)
<i>Years Employed in Current Job</i>	
Less than 1	10 (23.3)
1–3	11 (25.6)
4–7	10 (23.3)
8–12	5 (11.6)
13–20	3 (7.0)
20 or more	3 (7.0)
<i>Food Safety Certification</i>	
Yes	29 (67.4)
No	14 (32.6)

<sup>a</sup>Percentages may not total 100% because of non-responses.

**TABLE 2. Themes for proper handwashing for behavioral and control beliefs (n = 43)**

Themes	Frequency of text references
<i>Behavioral Beliefs</i>	
<i>Advantage</i>	
Food safety	32
Pride	8
<i>Disadvantage</i>	
Time consuming	20
Dry skin	11
Difficulty putting on gloves	7
Waste	3
<i>Control Beliefs</i>	
<i>Facilitator</i>	
Adequate/Accessible resources	27
Number/Accessibility of handwashing sinks	15
Proper training	8
<i>Barrier</i>	
Time consuming	15
Number/Accessibility of handwashing sinks	14
Difficulty putting on gloves	8
Bad habits	8
Adequate/Accessible resources	7

equal frequency by participants. Themes that emerged from the category of facilitators for proper handwashing included adequate and accessible resources, number and accessibility of handwashing sinks, and proper training. The theme “adequate and accessible resources” (n = 27), mentioned in all four focus groups, included the topics of availability and access to warm water, paper towels, and new technology. One employee identified elements that would make proper handwashing easier as including “warm water, making sure that the area’s been stocked with soap ... [and] towels.” Employees mentioned that specific aspects of technology, such as automatic faucets, foot pedals, powerful air dryers, and timers, would be facilitators of proper handwashing. For example, one employee stated, “automatic washers or pedals and air dryers would be nice.”

Number and accessibility of handwashing sinks (n = 15), which referred to the number of handwashing sinks available and their accessibility, was mentioned in all four focus groups. One employee stated, “it [would] be nice to have more than one hand washing sink when you have six people trying to wash their hands at the same time.”

Proper training (n = 8), which included items like posters above sinks and explaining the importance of proper handwashing, was mentioned in two focus groups. One employee mentioned, “Those little posters that they make for above the sinks are very handy ... especially for new employees.”

Themes of barriers to proper handwashing included a “time consuming,” “number and accessibility of handwashing sinks,” “bad habits,” “difficulty putting on gloves,” and “adequate and accessible resources.” The theme “time consuming” (n = 15), mentioned in all four focus groups, referred to the practice requiring too much time and employees feeling time constraints. One employee confirmed, “It takes a lot of time” to wash hands properly.

Accessibility of handwashing sinks (n = 14) included the number, accessibility, and obstruction of handwashing sinks and was discussed in all four focus groups. One employee provided a specific example of a barrier, stating, “The sink is under repair and you’ve got to go to another room to wash your hands.”

**TABLE 3. Themes for proper handling of food and work surfaces for behavioral and control beliefs (n = 43)**

Themes	Frequency of text references
<i>Behavioral Beliefs</i>	
<i>Advantage</i>	
Food safety	17
Employee responsibility	8
Food quality	4
Regulatory compliance	4
<i>Disadvantage</i>	
Time consuming	15
Increased food waste	6
Increased food cost	2
<i>Control Beliefs</i>	
<i>Facilitator</i>	
Adequate/Accessible equipment and resources	26
Adequate facilities	13
Proper training	4
Practice	3
<i>Barrier</i>	
Time consuming	14
Limited work space	8
Poor attitude	7
Improper training	4
Limited equipment	2

“Bad habits” (n = 8), mentioned in three focus groups, referred to the topics of not making handwashing a habit, not being in the practice of proper handwashing, bad habits formed, not taking the time to properly wash hands, and laziness. One employee said that a reason for not washing hands properly is because “they don't have a good practice of doing it ... there are some people who don't just wash their hands.”

“Difficulty putting on gloves” (n = 8), also mentioned in three of the four focus groups, refers to the difficulty of putting on gloves after proper handwashing. As one employee described their dissatisfaction, “I [would] still like to find an easier way to put [gloves] on. You can't get your hands dry enough to get that glove on.”

“Adequate and accessible resources” (n = 7), which referred to the topics of availability and access to warm water, paper towels, and new technology, was mentioned in three focus groups. One employee described the frustration of washing hands by stating, “You're squeezing ... the con-

tainer to get the last bit of soap and then there's no paper towels. That is frustrating.”

#### **Proper handling of food and work surfaces**

The frequency of themes related to behavioral beliefs and control beliefs identified by participants for proper handling of food and work surfaces is presented in *Table 3*. As shown, control beliefs (n = 83) were referred to by participants more frequently than behavioral beliefs (n = 56).

To establish behavioral beliefs, participants were asked to list good and bad things that could result from proper handling of food and work surfaces and reasons employees would want and not want to follow this practice. These advantages and disadvantages of performing the behavior help to determine an individual's attitude toward proper handling of food and work surfaces. Advantages (n = 33) were referred to more frequently than disadvantages (n = 23) by participants.

Themes that emerged from the category of advantages for proper handling of food and work surfaces included food

safety, employee responsibility, regulatory compliance, and food quality. Quotes related to regulatory compliance were mentioned in two focus groups, while the other themes were mentioned in all four focus groups.

Food safety (n = 17) referred to preventing cross-contamination, serving safe food, preventing illness, and preventing outbreaks. One employee's reasoning with regard to properly handling food and work surfaces was presented by stating, "I don't want anybody getting sick on my watch."

The theme "employee responsibility" (n = 8) included the ideas that "It's part of our job," and "it's just proper practice." Regulatory compliance (n = 4) referred to not getting in trouble with the health inspector and staying in compliance with state regulations. Employees also stated, "[we] stay in compliance," as a reason for properly handling food and work surfaces.

Food quality (n = 4) included the topics of making the food taste better and having less spoilage. One employee mentioned the "longevity of the food" as a positive result of properly handling food and work surfaces.

Themes that emerged from the category of disadvantages of proper handling of food and work surfaces included "time consuming," "increased food waste," and "increased food cost." "Time consuming" (n = 15), which referred to waiting for product, not having enough time, extra steps, and the practice having too many steps, was mentioned in all four focus groups. An employee illustrated this by stating, "You're just taking an extra step to clean and sanitize a surface or a utensil," while another reported, "You've got to have the patience to wait for that area to be cleaned before it's ready to be used again."

Increased food waste (n = 6) due to the practice was commented on in two focus groups. One employee described increased waste by stating, "If you see a little bit of mold out of a strawberry at home, you would cut the strawberry in half, get rid of it, and possibly still use it. Here, we throw the whole piece away ... and you drop an apple on the floor here, we have to throw it away." Increased food cost (n = 2) due to the practice was mentioned in two focus groups.

Within the control belief construct, facilitators (n = 48) were referred to more frequently than barriers (n = 35) when participants referred to proper handling of food and work surfaces. Themes that emerged from the category of facilitators for proper handling of food and work surfaces included adequate and accessible equipment and resources, adequate facilities, proper training, practice, and good attitude.

Adequate and accessible equipment and resources (n = 26), which included topics such as more sinks and the location of sinks, was discussed in three of the four focus groups. For example, one employee stated, "Having a sink right by my prep table" would make it easier to properly handle food and work surfaces.

Adequate facilities (n = 13), mentioned in three focus groups, referred to topics such as more space, more prepping

tables, different areas, and more storage. One employee suggested, "We need more prepping tables, more areas to actually work so that we can keep from putting them all in the same space; you could do different things in different areas."

Comments related to proper training (n = 4) were made in one focus group. Proper training referred to properly educating employees, setting expectations, and providing reminders in work areas. One employee shared the opinion, "I think posting steps [around your work facility] is very important" while another communicated that "properly educating" employees was important.

The theme "practice" (n = 3), mentioned in two focus groups, referred to repetition of the correct practice. Employees stated that "repetition" and "doing it over and over" are "part of the job and the more you do it the easier it gets for you."

The theme "good attitude" (n = 2), which referred to increasing teamwork among employees, was mentioned in two focus groups. An employee spoke of the benefit of having a mindset related to "team work and ... people working together instead of saying, 'Okay, well, that's not my job.'"

Themes from the category of barriers included "time consuming," "limited work space," "poor attitude," "improper training," and "limited equipment." "Time consuming" (n = 14), mentioned in all four focus groups, included items like "cleaning takes time," "employees trying to multi-task," and "being rushed." For example, one employee stated, "Sometimes we're in a rush. We just want to hurry up and get everything done."

Limited work space (n = 8), mentioned in two focus groups, referred to having insufficient space. For example, employees listed "being crowded" and "having other people come to your area where you're working on something" as barriers to proper handling of food and work surfaces.

"Poor attitude" (n = 7), mentioned in all four focus groups, referred to employees' laziness, while "improper training" (n = 4), mentioned in one focus group, included employees not being knowledgeable and not being properly taught. Employees described barriers to proper handling of food and work surfaces as, "Some people just don't like cleaning" and sometimes "you're improperly taught or trained."

The theme "limited equipment" (n = 2), which referred to not having enough equipment to complete job tasks, was commented on in one focus group. An employee stated, "We're fighting for time when we can [use the oven]. You need flat pans to work with, [and] we run out of them."

### **Proper use of thermometers**

The frequency with which participants identified themes related to behavioral beliefs and control beliefs related to using a thermometer to check the temperature of food is presented in *Table 4*. As it shows, behavioral beliefs (n = 109) were referred to more frequently than control beliefs (n = 68).



**TABLE 4. Themes for using a thermometer for behavioral and control beliefs (n = 43)**

Themes	Frequency of text references
<i>Behavioral Beliefs</i>	
<i>Advantage</i>	
Food safety	24
Food quality	15
Pride in employee work	13
Regulatory compliance	8
<i>Disadvantage</i>	
Thermometer calibration	17
Time consuming	13
Unnecessary step	12
Food quality reduction	4
Cross-contamination	3
<i>Control Beliefs</i>	
<i>Facilitator</i>	
Adequate/Accessible thermometers	23
Communication and teamwork	8
Good record keeping procedures	5
<i>Barrier</i>	
Unclear procedures	11
Attitude	10
Time consuming	6
Adequate/Accessible thermometers	5

For behavioral beliefs, participants were asked to list good and bad results of properly using a thermometer to check the temperature of food, as well as reasons why employees would want or not want to follow this practice. Identifying these advantages and disadvantages to performing the behavior assists in determining an individual's attitude toward using a thermometer to check the temperature of food. Advantages (n = 60) were referred to more frequently than disadvantages (n = 49) by participants.

Themes that emerged from the category of advantages for proper use of a thermometer included food safety, food quality, pride, and regulatory compliance. Statements related to regulatory compliance were referred to as an advantage in three focus groups, and all other themes were mentioned in all four focus groups.

"Food safety" (n = 24) referred to preventing the growth of microorganisms and thereby preventing illness. One employee used a thermometer to ensure "that the food is cooked thoroughly so no one gets sick."

"Food quality" (n = 15) included aspects such as flavor, better food, children liking the food, and food items being cold or dry. Employees stated that "the food [is] better because we're serving hot or warm food and not room temperature food" and "you don't want to serve warm fruit."

The theme "pride" (n = 13) included topics such as feeling that employees are supposed to properly use a thermometer to check the temperature of food, feeling that the employee must follow this practice, feeling that following the practice improves skills as a cook at home and work, and knowing when food is done. One employee stated, "I like hearing the kids say, 'You're the best cooker ever.' If it's hot, they're going to tell you that. If it's cold, they're going to say, 'That is not good.'"

"Regulatory compliance" (n = 8) included topics related to the employee perception that they are required to check the temperature of food because of rules or laws. "It's the rule. It's the law," and "We're supposed to check it," are examples of "regulatory compliance" statements.

Themes that emerged from the category of disadvantages for proper use of a thermometer included "thermometer

calibration,” “time consuming,” “unnecessary step,” “food quality reduction,” and “cross-contamination.” Thermometer calibration (n = 17), mentioned in all four focus groups, included topics such as thermometer inaccuracy issues, having inadequate equipment to calibrate thermometers, and the process of ensuring that the equipment is working properly. For example, one employee stated, “If you do not have your thermometer calibrated ... it’s not going to read the proper temperature.”

Mentioned in three focus groups, “time consuming” (n = 13) referred to being in a hurry and having to sanitize the thermometers and check the temperature of every food item. An employee described “time consuming” by stating “you wipe it down, ... put it in ... wait for it to reach its maximum temp, take it out, [and] wipe it down ... It’s a little time consuming.”

The theme “unnecessary step” (n = 12) referred to the feeling that using a thermometer on every food item is not necessary and was mentioned in all four focus groups. An employee said, “In my opinion, I don’t think it’s necessary at the end of the day because whatever’s left is down at the bottom ... and ... that’s hot.”

“Food quality reduction” (n = 4), which referred to issues of the food losing juices and changing appearance and the food being overcooked, was mentioned in one focus group. One employee said, “I’ve [checked] tater tots and the tater tot fell apart because I stuck the thermometer in it. So sometimes you can ruin food.”

“Cross-contamination” (n = 3), mentioned in three focus groups, referred to microbial contamination due to failure to properly clean and sanitize thermometers between uses. One employee stated, “If you don’t clean your thermometer properly ... you could contaminate [the food] you’ve just made and [need] to throw it out.”

For control beliefs, participants were asked to list things that would make it easier and more difficult to use a thermometer properly to check the temperature of food. These facilitators and barriers to performing the behavior help to determine an individual’s perceived behavioral control toward using a thermometer to check the temperature of food. Within the control belief construct, barriers (n = 32) were mentioned almost as often as facilitators (n = 36). Themes that emerged from the category of facilitators for proper use of a thermometer included adequate and accessible thermometers, good record keeping procedures, and communication and teamwork.

The theme “adequate and accessible thermometers” (n = 23) referred to having more thermometers, new thermometers, and easy-to-use thermometers and was mentioned in all four focus groups. Employees indicated, “Making sure everyone has a thermometer, and that it works,” and having “new thermometers that ... you don’t have to calibrate” would be facilitators to properly using a thermometer.

Mentioned in two focus groups, the theme “good record-keeping procedures” (n = 5) referred to keeping records to know who took the temperature of what food item, while the theme “communication and teamwork” (n = 8) referred

to topics like developing good work habits, communicating with other employees, and not having people feel rushed. One employee described an instance in which communication broke down and record keeping could have fixed the problem:

... we had an issue with some burgers that weren’t up to temp. I don’t know exactly what happened that day ... Somebody said, “You temped it.” Somebody said, “I thought you got it.” It was kind of he-said she-said ... If you had something where you could write [it] down ... by the oven, you could look at it and [know], “Oh, yeah. The burgers temped out at 165.”

Themes within the category of barriers included “unclear procedures,” “attitude,” “time consuming,” and “adequate and accessible thermometers.” The theme “unclear procedures” (n = 11), mentioned in all four focus groups, included topics such as difficulty reading the thermometer, poorly coordinated teamwork, and not knowing the importance of the practice. One employee admitted, “I’ve never temped French fries and I saw someone doing it the other day. I’m like, you’re supposed to temp those?”

“Attitude” (n = 10) referred to the feeling that the practice is not important and was mentioned in three focus groups. One employee said, “Sometimes people think it’s not important. ‘Oh, it’s just a tater tot, it’s all right.’” The theme “time consuming” (n = 6), which referred to the belief that the practice took too much time, was mentioned in three focus groups. One employee said, “There are so many steps of doing it and the waiting ... everything is [a] time issue.”

The theme “adequate and accessible thermometers” (n = 5) referred to not having a thermometer and was mentioned in three focus groups. One employee said, “I wear aprons with pockets. My thermometer ... is just ... in my [pocket]. I don’t have to go hunt it down anywhere.”

### **Normative beliefs**

Co-workers, parents, students, immediate supervisor, school nutrition director, school administrators, health inspectors, and teachers were acknowledged as important referent individuals or groups with expectations of certain behavior. These people were perceived as caring whether the three practices were followed properly. The most frequently mentioned group was “other employees” (n = 15), mentioned in all four focus groups. Also in all four focus groups, students (n = 9), immediate supervisors (n = 8), and school nutrition managers/directors (n = 8) were recognized in addition to co-workers. Parents (n = 9) were identified as important referent individuals or groups in three focus groups. In two of the focus groups, school administrators (n = 4), health inspectors (n = 3), and teachers (n = 3) were identified as people who would approve or disapprove of the way the practice was followed.

### **DISCUSSION**

Among the three food safety practices (proper hand-washing, handling of food and work surfaces, and use of

a thermometer to check the temperature of food), proper handwashing had the most overall quotes related to the TPB constructs, followed closely by use of a thermometer to check the temperature of food. These results indicate that participants discussed handwashing more actively than the other two practices. Consistent with this result, in a study by Clayton et al. (4) to explore salient beliefs of consumers related to food safety, the most reported food safety action was handwashing. Shapiro et al. (16) reported consumers felt more control over and had more positive attitudes toward handwashing than toward using thermometers. However, in contrast to the results of this study, a study conducted by Howells et al. (8) to explore barriers to performing proper handwashing, cleaning and sanitizing, and using a thermometer found that the number of barriers identified by restaurant employees was highest for cleaning and sanitizing work surfaces, next highest for using a thermometer, and lowest for handwashing.

For proper handling of food and work surfaces and handwashing, control beliefs were referred to more frequently than behavioral beliefs, indicating that factors perceived as impeding or facilitating (control beliefs) proper handwashing and handling of food and work surfaces have more impact on these participants than the perceived consequences of the practices (behavioral beliefs). However, for using a thermometer, behavioral beliefs were mentioned more frequently than control beliefs, indicating the perceived consequences (behavior beliefs) of using a thermometer has greater impact on these participants than the factors perceived as impeding or facilitating (control beliefs) the use of a thermometer. As previously mentioned, behavioral beliefs are linked to one's attitude and control beliefs are linked to one's perceived behavioral control, both of which directly influence one's behavioral intention.

In line with these results, Phillip and Anita (11) identified TPB factors that impact food handlers' behavioral intention to properly handle food as follows: subjective norms had the greatest impact, followed by perceived behavior control and then attitude toward the behavior. However, Pilling and colleagues (12) reported that attitudes of foodservice employees significantly predicted the behavioral intention of handwashing, using thermometers, and sanitizing surfaces. In this study, control beliefs, an antecedent to perceived behavior control, were discussed more often than behavioral beliefs, an antecedent to attitude; this highlights the importance of control beliefs and perceived behavioral control for these participants.

All three food safety practices overlapped with regard to several themes. Among all three practices, the most frequently mentioned advantage was keeping food safe. Having adequate and accessible resources and equipment was the most frequently mentioned facilitator. Being too time consuming was identified as a disadvantage as well as a barrier to properly following all three food safety practices.

In agreement with the results of this study, Green and Selman (7) reported time pressure as a factor impacting the food safety practices of handwashing, cross-contamination prevention, and thermometer use.

"Time consuming" was a frequently identified disadvantage and barrier. For the specific practices of proper handwashing and handling of food and work surfaces, the most frequently mentioned disadvantage and barrier was that performing the practice was time consuming. The most frequently mentioned disadvantage to using a thermometer was the need for thermometer calibration; however, this was followed closely by the perception that the practice was too time consuming. The most frequently mentioned barrier was unclear procedures, followed closely by the view that performing the practice was too time consuming. Congruent to the results in this study, Howells et al. (8) identified time constraints as the greatest barrier for three food safety practices (cleaning and sanitizing, handwashing, and thermometer use).

Among all four focus groups, employees perceived their co-workers, the students, their supervisor, and the school nutrition director as important people who would care whether the employee performed the three practices properly. Green and Selman (7) also reported management and co-worker emphasis as factors impacting food safety practices for food workers.

The results provide insight into factors that affect employees' behavior and that may prevent them from applying their knowledge to follow proper food safety practices. This elicitation study has identified school nutrition employees' thoughts and feelings about three food safety practices, which strongly determine their attitude, subjective norm, and perceived behavioral control. According to TPB (1), salient beliefs, attitudes, subjective norms, perceived behavioral control, and behavioral intention allow for the understanding and prediction of behavior. Identifying the most common beliefs about proper handwashing, handling of food and work surfaces, and using a thermometer, then, is an essential first step for the development of interventions to motivate employees to practice safe food handling in school nutrition programs. Results from this study suggest that intervention strategies to improve food safety practices in school nutrition settings should do the following: target employees' behavioral beliefs related to keeping food safe to reduce illness; focus on control beliefs related to access to—and availability of—proper equipment, resources, and supplies; and highlight social pressures from other employees, parents, and students. Greater emphasis should be placed on the food safety practices relating to proper handwashing and using a thermometer to check the temperature of food.

The use of purposive sampling limits generalization to an entire population. However, school nutrition settings across the U.S. are required to abide by various federal regulations and laws, which creates a fairly standardized, homogeneous system of practices and procedures, allowing for generalizations

regardless of size or location of the group studied. Another limitation is the repetitive nature of the elicitation study; reusing questions for each food safety behavior could have distracted participants. Additional limitations of focus groups are cross-talking and participants not staying on topic, so that moderators were required to actively manage the focus group to keep participants on topic. This was achieved by clearly defining the practice, providing participants with a copy of the questions, and intervening when conversations were off topic. Last, confidentiality could not be assured during focus group proceedings, possibly preventing some participants from sharing their views because of risk of negative reaction or provoking some participants to share inflated views to elicit positive reaction from other participants. To overcome social desirability and create an inviting environment in which participants could share freely, focus groups were conducted with existing groups with prior established relationships, and participants selected pseudonyms to protect their identity during the focus group meetings.

This study is believed to be the first study using theory-based investigation to examine salient beliefs of child

nutrition professionals that affect the specific food safety practices of proper handwashing, handling of food and work surfaces, and correct use of a thermometer to check the temperature of food. The results of the study advance the body of knowledge related to proper food safety practices in the school nutrition sector and use of the TPB. From the results of this elicitation study, behavioral, normative, and control beliefs were identified among child nutrition professionals and will be integral in the development of a questionnaire to explore the TPB model, which will be used in a future study to determine specific interventions to motivate safe handling of food in school foodservice settings.

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