Behavioral Assessment Study: Changing Food Safety Practices of School Nutrition Employees, Phase I

The Center of Excellence for
FOOD SAFETY RESEARCH IN CHILD NUTRITION PROGRAMS

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Changing Food Safety Practices of School Nutrition Employees, Phase I Summary Report

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Executive Summary

Employees' proper food safety knowledge and beliefs are important in helping protect schools and children from foodborne outbreaks. Simply teaching employees about food safety is, however, not enough to change on-the-job behavior. Barriers, such as lack of proper equipment and time pressures, inhibit employees' ability to perform safe food practices.

The dangers of foodborne illness provide compelling reasons to explore previous findings in the broader foodservice environment, specifically the conceptual relationships surrounding employee behavior within the school nutrition environment. Thus, the purpose of this study was to use the Theory of Planned Behavior (TPB) to investigate the relationships between school nutrition employees' beliefs about food safety and three food safety practices of proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature of food.

An elicitation study was conducted to help inform the questionnaire development. Once completed and pilot tested, 3,850 surveys were mailed to 163 participating school districts. Data analysis was conducted on 408 usable surveys, for a response rate of 10.6%.

Subjective norms and perceived behavioral control are two of the TPB constructs that significantly contributed to predict proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature of food. Attitude, the third TPB construct, was not a statistical predictor of behavioral intention. Employees indicated strong positive social pressures, or subjective norms, helped to motivate performance of each of the three practices. Employees also identified access and lack of equipment as behavioral controls that might prevent them from performing these food safety practices.

Acknowledgements

Background

Foodborne pathogens account for more than 9.4 million cases of illness, 55,000 hospitalizations, and 1,300 deaths each year in the United States (Scallan et al., 2011). Food safety practices like proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature of food can reduce foodborne disease outbreaks (United States Food and Drug Administration and the American Medical Association, n.d.). Through the National School Lunch Program, School Breakfast Program, and Summer Food Service Program, 7.5 billion meals and snacks are served annually across the United States (USDA, Food and Nutrition Service [FNS], 2016). Should improper food safety practices occur, large-scale foodborne outbreaks can happen with serious implications for schools, school nutrition employees, and the children involved (USDA, FNS, 2016).

Employees' knowledge and attitudes are important to protecting schools and children from foodborne outbreaks (Henroid & Sneed, 2004). Simply increasing employee knowledge of food safety, however, is not enough to change on-the-job behavior (Roberts et al., 2008). Employees and managers have reported barriers, such as proper equipment and resources, training and education, and time pressures that influence their ability to follow safe food practices (Green & Selman, 2005; Roberts et al., 2008). Interventions to change foodservice employees' behaviors should focus on barriers that affect their ability to properly prepare and serve safe food (Mitchell, Fraser, & Bearon, 2007). Thus, research should not only identify these barriers, but also explore the antecedents to behavior and behavioral intention in attempting to change these behaviors. Webb and Sheeran (2006), conducted a meta-analysis of behavior

change research and concluded that interventions predicted changes in both behavioral intention and actual behavior.

The Theory of Planned Behavior (TPB; Ajzen, 1991) states that behavioral intention best predicts actual behavior. According to the TPB (Figure 1), three antecedents directly influence a person's behavior: his or her attitude, subjective norm, and perceived behavioral control (Ajzen, 1991). These antecedents can be measured directly and indirectly. To use the TPB to motivate behavior change, we must identify salient beliefs about the behavior (Ajzen, 2011). Salient beliefs, also referred to as indirect measures, are the significant and fundamental beliefs one holds about the behavior (Ajzen, 2011). In the TPB, these salient beliefs include behavioral, normative, and control beliefs (Ajzen, 1991).
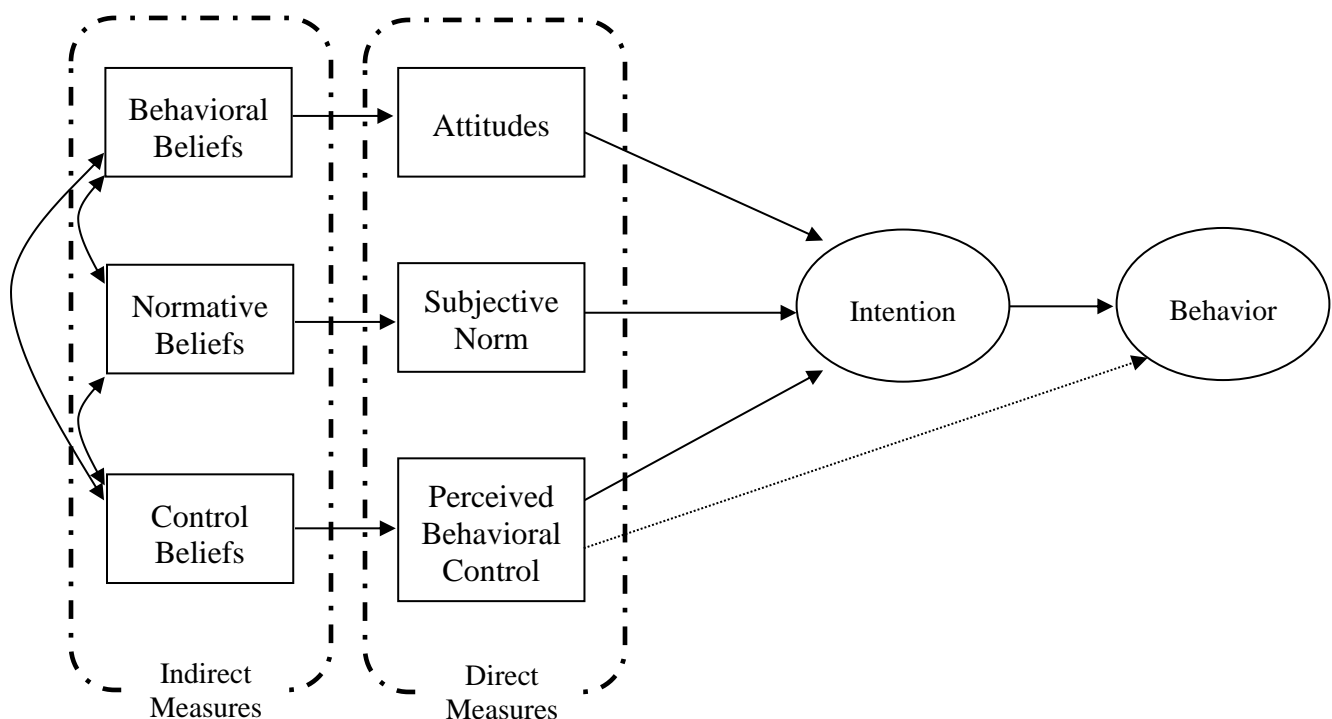
Figure 1. Theory of Planned Behavior (Ajzen, 1991)

Behavioral beliefs include advantages and disadvantages to performing the behavior (Ajzen, 1991). When combined with the perception of a specific outcome, behavioral beliefs determine one's attitude toward the behavior (Ajzen, 1991). Control beliefs include barriers and facilitators to performing the behavior. When combined with the perception of power of these factors, control beliefs determine one's perceived behavioral control (Ajzen, 1991). Normative beliefs are the perceived expectations of people who care about the performance of the behavior. When combined with one's motivation to comply, normative beliefs determine one's subjective norm (Ajzen, 1991). Therefore, the indirect measures of attitude, subjective norm, and perceived behavioral control include behavioral beliefs and outcome evaluations, normative beliefs and motivation to comply, and control beliefs and power of control, respectively.

Once significant beliefs have been determined, interventions, among them educational materials and training, can be developed and/or modified to elicit true behavior change. For example, employees may feel that proper handwashing is not important because they previously may not have washed their hands and, to their knowledge, no one became ill. Interventions must target this belief to help employees understand why this belief is problematic by giving them concrete examples where foodborne outbreaks did occur because of poor handwashing practices.

Training courses vary greatly in delivery style, duration, type of training, and target audience. These differences make it difficult to assess the effectiveness of interventions (Egan et al., 2007). Developing a comprehensive training model that uses enhanced educational materials may help overcome barriers to implementing proper food safety practices in schools. One innovative approach to food safety education, knowledge retention, and possible behavior change is the storytelling or dramatic narrative approach. Lordly (2007) and Weil (2015) reported these approaches increased retention of knowledge compared to traditional classroom

delivery methods. Harris and Barnes (2006) noted great potential for using similar methods to educate and motivate employees by telling compelling stories to relay important information.

Therefore, a two-phase research project was designed to apply storytelling as a pedagogy and utilize the Theory of Planned Behavior to investigate the relationship among employees' knowledge, attitude, social norm, and perceived behavioral control in the school foodservice environment. The details of Phase I of this project are presented in this report. The purpose of Phase I of this study was to use TPB to investigate what school nutrition employees believed about three food safety practices: proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature of food. Barriers within the schoolwork environment also were explored and applied within the context of the theory. Specific objectives of this phase of the study included:

1. Determining the salient beliefs school nutrition employees have about the three food safety behaviors.
2. Determining employees' attitudes about the three food safety behaviors.
3. Determining the subjective norms among school nutrition employees related to the three food safety behaviors.
4. Determining behavioral controls that may prevent school nutrition employees from following proper food safety practices.
5. Applying the Theory of Planned Behavior Model to determine significant variables that can influence behavioral intention.
6. Recommending beliefs to target for actual behavior change that will inform the development of storytelling modules to enhance existing food safety training.

Definition of Terms

Absolute intenders: Participants who absolutely intend to practice the behavior (those whose total behavioral belief score was 7.0 on a 7.0 scale).

Attitudes: The positive or negative evaluation of performing the behavior (Ajzen, 2006).

Behavioral beliefs: Beliefs that a behavior generates a certain consequence. These beliefs are linked to one's attitude toward the behavior (Ajzen, 2006).

Control beliefs: Beliefs of the existence of barriers and facilitators that impact the performance of a behavior. These beliefs are linked to one's perceived behavioral control (Ajzen, 2006).

Direct measures: The immediate, equally weighted antecedents of behavioral intention including: attitude, subjective norm, and perceived behavioral control (Ajzen, 2006).

Elicitation study: A qualitative study conducted among a subset of a population to explore salient behavioral, normative, and control beliefs about a behavior (Ajzen, 2011).

Indirect measures: The antecedents of direct measures. Also referred to as salient beliefs (Ajzen, 2006).

Intention: A person's likelihood to perform a behavior. Behavioral intention is the immediate antecedent to actual behavior (Ajzen, 2006).

Lower intenders: Participants who do not intend to practice the behavior (those whose total behavioral belief score was less than 7.0 on a 7.0 scale).

Normative beliefs: Beliefs that important individuals or groups have expectations for one's behavior. These beliefs are linked to one's subjective norms (Ajzen, 2006).

Perceived behavioral controls: One's perceived capability to perform a behavior (Ajzen, 2006).

Proper cleaning and sanitizing of food contact surfaces: Not allowing raw food to come into contact with ready-to-eat foods, cleaning and/or sanitizing all food contact surfaces between each use, and cleaning and sanitizing all food contact surfaces when switching from one food preparation task to another.

Proper handwashing: Washing hands with soap and hot water for 20 seconds; drying with an air dryer or single-use paper towel, washing hands before work, washing hands before putting on gloves, washing hands when food preparation tasks are interrupted or changed, and washing hands whenever they come in contact with something that might have germs.

Salient beliefs: A person's behavioral, normative, and control beliefs that determine one's attitude toward the behavior, subjective norm, and perceived behavioral control, respectively (Ajzen, 2006).

School Food Authority: The governing body which is responsible for the administration of one or more schools, and has the legal authority to operate the program therein or be otherwise approved by FNS to operate the program (7 C.F.R. § 210.2, 1988).

Subjective norms: The social pressure one perceives to perform or not perform a behavior (Ajzen, 2006).

Theory of Planned Behavior: A theory that explains actual behavior by linking one's beliefs to their attitudes, subjective norms, and perceived behavioral controls and to their behavioral intention (Ajzen, 2006).

Using a thermometer to check the temperature of food: Using a thermometer to check the temperature of food at the completion of cooking, at the completion of reheating, to ensure that food stored on the hot line was at least 135°F, and to ensure that food stored on the cold line was at 41°F or less.

Methods

Direct measures, including attitudes, subjective norms, and perceived behavioral controls, are assessed by asking respondents to rate each construct (Ajzen, 2011). Indirect measures, or belief-based measures, can be evaluated by assessing the strength of commonly held beliefs.

By using belief-based measures, researchers can identify the rationale behind employees' perceptions of attitudes, subjective norms, and perceived behavioral controls. Moreover, the use of belief-based measures reduces the concern about scale reliability because predictor variables are combined into a single composite score, which represents the construct of interest (see Figure 1; Ajzen, 1991). To determine the belief-based measures, Ajzen (2011) suggests an elicitation study to clearly identify the behavioral, normative, and control beliefs among the population of interest for each specific behavior. Through the elicitation study, a list of commonly held beliefs can be developed and integrated into a questionnaire. The questionnaire is then used to quantify these beliefs and model potential relationships among the variables.

Part I: Elicitation Study

An elicitation study to determine behavioral, normative, and control beliefs of school nutrition employees about each of the three identified behaviors (proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature

of food) was conducted using four focus groups. The results of this study guided the questionnaire development.

Sample

Study participation and response rates are becoming increasingly difficult to achieve. Past surveys administered by the Center have yielded 7% to 14% response rates. A convenience sample of school nutrition directors was generated through a list of previous participants of Serving Up Science: The Path to Safe Food in Schools, a four-day research-based educational program developed by the Center. Selections were based on proximity to Kansas State University. School nutrition directors were contacted with an introductory telephone call to explain the project and request their assistance. A follow-up email with more information, an informational poster, and a sign-up sheet were sent to the directors. Focus group sessions were scheduled to take place in the district's administration building and employees from the district were invited by directors to attend. School nutrition directors received a reminder e-mail the day before the focus group met. Forty-three school nutrition employees from four school districts participated in the four focus groups during the study: two districts in Kansas, one district in Nebraska, and one district in Missouri.

Data Collection Tools

The research team developed a demographic questionnaire and a discussion guide (Appendix A). Demographic information was requested from participants to gather information such as gender, age, level of education, length of time working in foodservice operations, length of time working at current operation, and food safety certification.

The discussion guide was based on the research by Ajzen (2011) and was adapted from a previous study in the commercial restaurant setting (Roberts et al., 2008). The guide included 19

open-ended questions, with six questions for each of the three behaviors (proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature of food) and one question regarding those people who can affect employee performance of food safety practices.

Data Collection

Four in-person focus groups were conducted, each with 10-11 participants. The length of focus group discussions ranged from 40 to 55 minutes; these sessions were recorded using a digital voice recorder. Upon arrival, the moderator thanked the participants for joining the discussion and asked them to complete the consent form and demographic questionnaire. After all participants had arrived, the moderator began the session by welcoming the participants, reviewing the goals of the session, and describing the process that would be followed. A moderator's instruction guide was used to ensure that each group received the same instructions (Appendix A).

After the introduction, the moderator outlined the behaviors of interest and provided a detailed definition of each specific behavior. Each participant received a copy of the discussion questions and behavior definitions to reference during the focus group (Appendix A). The moderator allowed ample time for responses, and each question was repeated several times. During the focus group, an assistant moderator took notes. The moderator and assistant moderator debriefed within 48 hours of each focus group using a debriefing guide (Appendix A).

Data Analysis

A visual representation of data analysis steps is presented in Figure 2. All focus groups' responses were audio recorded, transcribed, and pooled for analysis of key themes and topics. Responses to the demographic questionnaire were entered into Microsoft Excel (Version 2013)

and descriptive statistics (frequencies, percentages, and means) were calculated. Three researchers independently analyzed transcripts through manual, free, line-by-line coding to generate an initial list of themes that were categorized using the TPB constructs. Researchers subsequently met to validate the themes until agreement was achieved. A theme-book was developed to be used in qualitative data analysis software.

Transcripts were entered into NVivo 11 (QSR International Pty Ltd. Version 11, 2015), and analyzed using a template coding method by three researchers. 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 were established for behavioral beliefs, "advantages" and "disadvantages" and for control beliefs, "facilitators" and "barriers". Researchers met to interpret the coding process reaching an inter-rater reliability level of "good" agreement, with a Light's kappa greater than .60 (Light, 1971).

Transcription	**Coding** •Manual •Line-by-line •Three researchers •Organized using TPB constructs	**Validation** •Three researchers validated themes

Theme-Book •Entered into NVivo 11 •Primary nodes: Food safety practices •Secondary nodes: Salient beliefs	**Inter-Rater Reliability** •Good agreement •Light's kappa ≥ 0.60
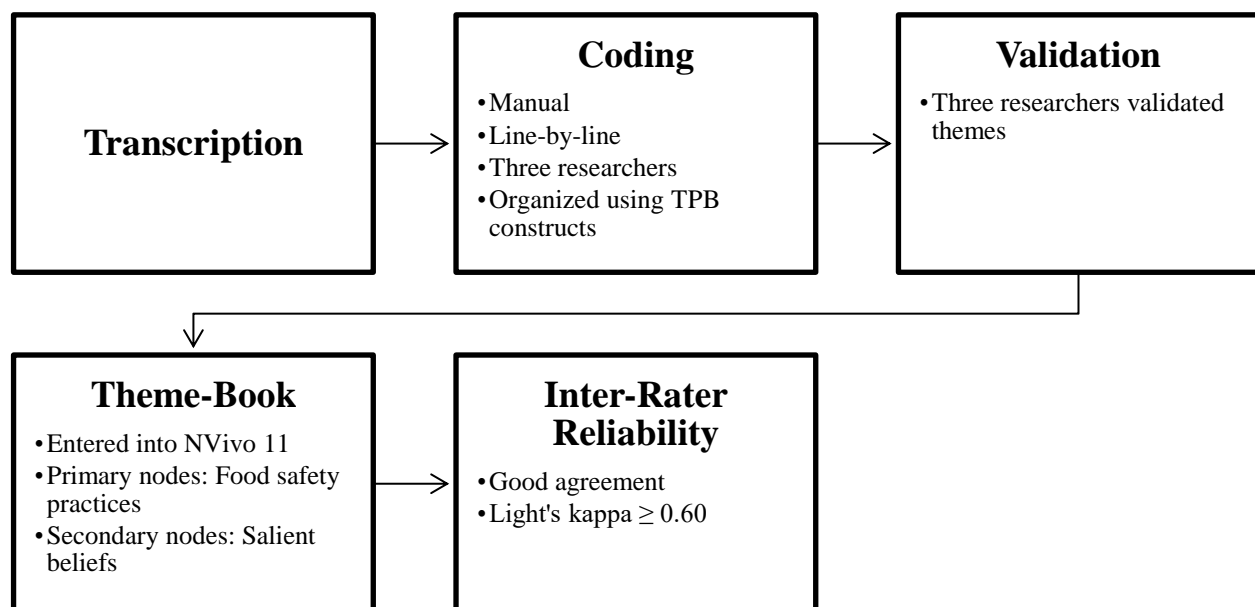
Figure 2. Elicitation Study Data Analysis Steps

Part II: Primary Study

A questionnaire was developed to obtain information about attitudes, subjective norms, and perceptions of control among school nutrition employees. During the elicitation study, participants identified behavioral, normative, and control beliefs which were used to inform the development of the questionnaire.

Both direct and indirect measures of each construct were utilized and are described in the final questionnaire portion of this section. Ajzen (2011) noted that direct measures often show low reliability. By utilizing the indirect measures to evaluate the beliefs subjects have about a particular concept, researchers can more fully understand the attitudes, subjective norms, and perceived behavioral controls that subjects have. Moreover, the indirect measures are combined into a composite score, which represents the construct. This reduces the concern about reliability (Ajzen, 2011).

Sample

The sample was comprised of school nutrition employees affiliated with 163 school districts from seven randomly selected states: Virginia, Illinois, Colorado, New York, South Carolina, Texas, and California. Each state represented one of the seven regions defined by the USDA Food and Nutrition Service. A list of school districts from the National Center for Education Statistics website (https://nces.ed.gov/ccd/districtsearch/) was compiled for each state and categorized by size. Districts were classified as mega if they had 40,000 or more students, large if they had 20,000 to 39,999 students, medium if they had 2,500 to 19,999 students, and small if they had fewer than 2,500 students. A convenience sample of school districts was then selected based on size and last day of school for that particular school district. School nutrition contact information and closing dates were verified through each school district's website to

ensure questionnaires would be received before the end of the school year. The researchers attempted to distribute the questionnaires uniformly among the seven states based on availability of schools and district size. A total of 12 mega school districts, 30 large school districts, 54 medium school districts, and 67 small school districts were included in the study.

The operational characteristics for each school were gathered from each school district's website or the National Center for Education Statistics website. Information included school name, address, number of students, school nutrition program information, and last day of school. A total of 3,850 surveys were mailed to selected school district directors who were asked to distribute surveys to employees. Table 1 presents the questionnaire distribution by district size and region. The goal was to receive 500 complete and usable questionnaires for data analysis, which would represent a 14% response rate and would have been similar to previous research conducted by The Center of Excellence for Food Safety Research in Child Nutrition Programs (Grisamore & Roberts, 2014).

Table 1. Breakdown of Questionnaire Distribution by USDA FNS Region and District Size					
USDA Region	Mega	Large	Medium	Small	Total
Mid-Atlantic	100	200	140	100	540
Midwest	50	250	160	100	560
Mountain Plains	200	100	160	100	560
Northeast	100	200	140	70	510
Southeast		300	180	100	580
Southwest	50	250	160	100	560
Western	100	200	140	100	540
Total	600	1500	1080	670	3850
Percentage	15.58	38.96	28.05	17.40	100.00

Questionnaire Development

Dillman's (2007) total design method was used to maximize the questionnaire response rate. The questionnaire (Appendix B) was adapted from research conducted by Roberts and

Barrett (2011) and enhanced by the results of the elicitation study. The five-member research team reviewed and revised the questionnaire before the pilot test.

Pilot Test

The survey was pilot tested using a convenience sample of 101 school nutrition employees. In addition to completing the questionnaire, participants were asked to complete an evaluation form to provide feedback on clarity of statements and time required to complete the questionnaire. Changes in format and content were incorporated according to recommendations. Employees that participated in the pilot test were not included in the final study sample. Therefore, data collected during the pilot test was not included in the final results.

Final Questionnaire

The final questionnaire was printed in a booklet format containing 16 pages (Appendix B). The questionnaire included 31 questions to measure eight constructs including direct and indirect measures and respondent demographics (Figure 3). Before each section, a detailed definition of each behavior was provided.

Direct Measures

Employee attitudes were measured using a set of five semantic 7-point scales as recommended by Ajzen (2011). The five semantic scales included good/bad, worthless/valuable, useless/useful, unpleasant/pleasant, and foolish/wise.

Subjective norms, behavioral intentions, and perceived behavioral controls were measured using a 7-point scale anchored from strongly disagree (1) to strongly agree (7).

Direct	1. Attitude 2. Subjective Norm 3. Perceived Behavioral Control 4. Behavioral Intention
Indirect	5. Behavioral Belief 6. Normative Belief 7. Control Belief
Demographics	8. Demographic Questions
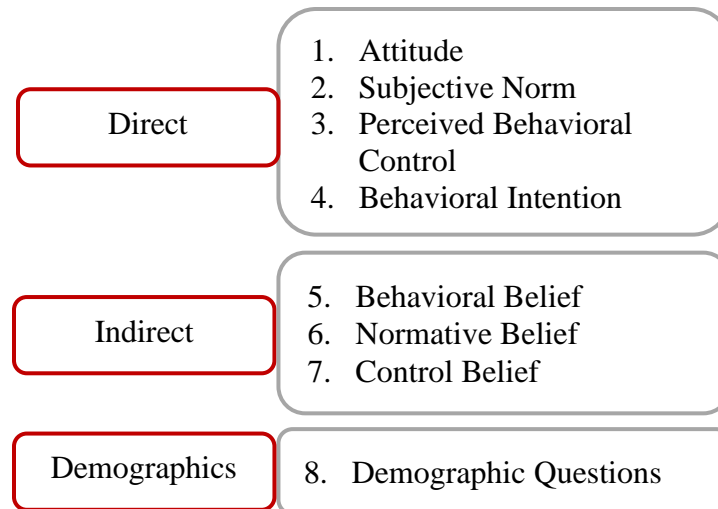
Figure 3. Eight Constructs Measured on the Questionnaire, Including Direct and Indirect Measures and Demographics.

Subjective norms were measured using three questions about the importance of the referent groups/individuals approving the behavior. Perceived behavioral controls were measured with two questions, and behavioral intention was measured using three questions about the likelihood of performing the behavior.

Indirect Measures

Behavioral Beliefs: Behavioral beliefs were measured using the overall sum of the belief strength multiplied by the outcome evaluation ($\sum bb_i be_i$). Therefore, for each of the four behavioral beliefs identified, a question was asked to address the behavioral belief (bb_i) while another addressed the outcome associated with the belief (be_i).

Four behavioral beliefs were identified in the elicitation study. These beliefs include customer satisfaction, decreasing likelihood of students becoming ill, ensuring high food quality, and time and were measured by asking the respondents to rate the strength of their beliefs on a 7-point scale anchored from strongly disagree (1) to strongly agree (7). Outcome evaluations were

measured by asking respondents how important each of the beliefs were to them using a 7-point scale anchored from extremely unimportant (1) to extremely important (7).

Normative Beliefs: Nine referent groups/individuals (immediate supervisor, school nutrition director, other employees, students, parents, teachers, school nurse, school administrators, and the health inspector) were identified in the elicitation study. Using a 7-point scale ranging from strongly disagree (1) to strongly agree (7), participants rated how likely each referent group/individual would think each behavior should be followed. Using a 7-point scale ranging from not at all (1) to very much (7), participants evaluated how much they care about the referent group's or individual's concerns. This was measured in order to address participant motivation to comply with each belief.

Normative beliefs represent the overall sum of the belief strength multiplied by the motivation to comply ($\sum nb_i mc_i$). Therefore, for each of the nine normative beliefs identified, a question was asked to address the normative belief (nb_i) and another question addressed the motivation to comply with the belief (mc_i).

Control Beliefs: Five control beliefs (limited time, limited funds, lack of proper equipment, lack of access to proper equipment, and lack of available supplies) were identified through the elicitation study. Control beliefs are the sum of the belief strength multiplied by the perceived power of the control belief ($\sum cb_i pp_i$). Therefore, for each of the five control beliefs identified, a question was asked to address the control belief (cb_i) and another to address the perceived power of the identified control (pp_i).

Control beliefs were measured using a 7-point scale ranging from strongly disagree (1) to strongly agree (7). The perceived power of those control beliefs was also measured using a 7-

point scale ranging from very rarely (1) to very frequently (7). Respondents were asked how often not having the item affects their ability to perform each of the three food safety behaviors using the above scale.

Demographics

The last section of the questionnaire contained seven demographic questions about the respondent's gender, age, education level, food safety certification, years worked in the foodservice industry, and years working at the current organization.

Data Collection

A postcard (Appendix C) was sent by email or through postal mail to school nutrition directors or the School Food Authority to invite their employees to participate in the study and to alert them to expect questionnaires via FedEx. Questionnaires were then immediately sent to all selected school districts via FedEx Express. The number of questionnaires sent was determined by the size of the district. Each mega and large school district received 50 questionnaires, medium school districts received 20 questionnaires, and each small school district received 10 questionnaires. School nutrition directors or the School Food Authorities were asked to distribute all questionnaires to employees within their district.

Each school district was provided a packet with an introduction letter, questionnaires, and business reply envelopes to facilitate returning the questionnaires. The introduction letter, addressed to school nutrition directors, explained the purpose of the study and requested distribution of the questionnaire among employees (Appendix D). Following Dillman's recommendation, a follow-up postcard was sent to prompt non-respondents to complete the questionnaire (2007). Postcards were sent by email to those with e-mail addresses and by postal

mail to those with no email address listed on the school district's website. A second reminder post-card was sent to those with email addresses two weeks after the first reminder.

Within the questionnaire, a cover letter instructed employees to complete the questionnaire and then seal the top, bottom, and sides before returning it to the school nutrition director. School nutrition directors returned completed questionnaires using the postage-paid return envelope.

Data Analysis

Returned questionnaires were coded, and the data were processed and analyzed using the Statistical Package for Social Sciences (SPSS) version 18.0. Descriptive statistics were used to determine frequencies, means, and standard deviations. Cronbach's alpha was used to measure internal consistency using a threshold of 0.70 (Cronbach, 1951).

The procedure to score indirect measures of attitude, subjective norm, and perceived behavioral control includes recoding the scales of outcome evaluations, motivation to comply, and control belief power, whereas 1 is recoded as -3, 2 as -2, 3 as -1, 4 as 0, 5 as 1, 6 as 2, and 7 as 3. Once these response scales are recoded, a formula is used to determine the overall indirect measure. For the indirect measure of attitude, the product of behavioral beliefs and outcome evaluations is utilized. For the indirect measure of subjective norm, the normative beliefs is multiplied by motivation to comply, while the indirect measure of perceived control belief is represented by the product of control beliefs multiplied by control belief power. The recoding is done so that the midpoint of the scale is 0, thus easily allowing the researcher to determine if the final score represents a barrier (products less than 0) or an influencing factor (products greater than 0) to the behavior (Francis et al., 2004).

For the direct measures of attitude, perceived behavioral control, subjective norm, and behavioral intention, principal axis factor analysis with varimax rotation was conducted on the constructs independently. Using a minimum eigenvalue of 1.0, one factor was extracted for each of the three measures.

Simple linear regression analyses was used to examine the relationship between indirect measures (behavioral, normative, and control beliefs) and their corresponding direct measures (attitudes, subjective norms, and perceived behavioral controls). Multiple linear regression analysis was used to identify the relationship between direct measures (attitudes, subjective norms, and perceived behavioral control) and behavioral intention. T-tests were conducted to determine differences among absolute intenders and lower intenders.

Research Approval

Kansas State University's Institutional Review Board approved the research protocol before data were collected. All researchers involved in the study successfully completed mandatory human subjects training.

Results and Discussion

The results and discussion section will present the results of the elicitation study and the primary study. The elicitation study was utilized to identify behavioral, normative, and control beliefs among the sample related to proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature of food and was integral in the development of the final questionnaire. The primary study explored salient beliefs, attitudes, subjective norms, perceived behavioral controls, and behavioral intentions for each of

the three identified behaviors: proper cleaning and sanitizing of food contact surfaces, proper

handwashing, and using a thermometer to check the temperature of food.

Part I: Elicitation Study

Sample description

Forty-three school nutrition employees from four school districts in three different states

(Kansas, Missouri, and Nebraska) participated in the elicitation study. Demographic

characteristics of participants are summarized in Table 2.

Table 2. Characteristics of Elicitation Study Participants (N=43)					
Characteristic	**n**	**%**	**Characteristic**	**n**	**%**
Age			*Years employed in foodservice*		
29 years or younger	6	14.0	Less than 1	4	9.3
30-39 years	4	9.3	1-3	7	16.3
40-49 years	11	25.6	4-7	7	16.3
50-59 years	13	30.2	8-12	8	18.6
60 years or older	9	20.9	13-20	10	23.3
			20 or more	7	16.3
Gender					
Male	5	11.6	*Years employed in current job*		
Female	38	88.4	Less than 1	10	23.3
			1-3	11	25.6
Education			4-7	10	23.3
High School	20	46.4	8-12	5	11.6
Some College	19	44.2	13-20	3	7.0
Bachelor's Degree	2	4.7	20 or more	3	7.0
Graduate Degree	2	4.7			
			Food Safety Certification		
Current Work Status			Yes	29	67.4
Full-time	33	76.7	No	14	32.6
Part-time	10	23.3			

Most employees participating in the study were female (88.4%) and 40 years old or older

(76.7%). Most (76.7%) participants were full-time employees with more than half (58.2%)

having eight or more years of foodservice experience. Most (72.2%) had been employed seven

years or less in their current position. When asked about food safety certification, 67.4% of the employees self-reported having food safety certification.

<div align="center">*Salient Beliefs*</div>

School nutrition employees who participated in the elicitation study expressed behavioral, control, and normative beliefs when following proper handling of food and work surfaces, proper handwashing procedures, and using a thermometer. Identified salient beliefs are summarized in Table 3.

During the elicitation study, participants were asked about handling of food and cleaning of work surfaces. After analyzing the results, researchers decided to rephrase this as food contact surfaces for the primary study questionnaire because it reflected participants' responses during the elicitation study.

In some cases, participants identified the same beliefs for all three practices. Keeping food safe was identified as an advantage for following each practice. Adequate and accessible

Table 3. Salient Beliefs Identified Through the Elicitation Study (N=43)
Handling of Food and Cleaning of Work Surfaces

Behavioral Beliefs

Advantages	Disadvantages
• Food safety	• Time consuming
• Food quality	• Increased food waste
• Regulatory compliance	• Increased food cost
• Employee responsibility	

Control Beliefs

Facilitators	Barriers
• Adequate/accessible equipment and resources	• Time consuming
• Adequate facilities	• Limited work space
• Proper training	• Limited equipment
• Good attitude	• Improper training
• Practice	• Poor attitude

Table 3. Salient Beliefs Identified Through the Elicitation Study (N=43) (Continued)

Handwashing

Behavioral Beliefs

Advantages	Disadvantages
• Food safety • Pride	• Dry skin • Time consuming • Waste • Difficulty putting on gloves

Control Beliefs

Facilitators	Barriers
• Adequate and accessible resources • Number and accessibility of handwashing sinks • Proper training	• Time consuming • Number and accessibility of handwashing sinks • Adequate and accessible resources • Bad habits • Difficulty putting on gloves

Using a Thermometer to Check the Temperature of Food

Behavioral Beliefs

Advantages	Disadvantages
• Food safety • Food quality • Pride in employee work • Regulatory compliance	• Cross contamination • Time consuming • Thermometer calibration • Unnecessary step • Food quality reduction

Control Beliefs

Facilitators	Barriers
• Adequate and accessible thermometers • Communication and teamwork • Good record keeping procedures	• Time consuming • Adequate and accessible thermometers • Unclear procedures • Attitude

equipment was established as a facilitator. Time was identified as a barrier to performing the three practices. It is possible for an item (e.g., adequate and accessible equipment) to be listed as both a facilitator and a barrier. In these instances, a subject may have listed it as a facilitator, but another may have indicated it was a barrier in their school.

To determine normative beliefs, participants were asked to identify individuals whom they thought would approve if they followed the three food safety practices and those who would disapprove. Employees frequently mentioned their immediate supervisor, the school nutrition director, other employees, students, parents, teachers, school administrators, and the health inspector.

Part II: Primary Study

A total of 3,850 surveys were sent to participating school districts, and 580 surveys were returned. Of the 580 returned surveys, 172 were excluded because of patterned responses or missing data, resulting in 408 usable surveys, for a usable response rate of 10.6%. However, not all 408 participants completed the survey in its entirety. Therefore, the N reported may change throughout the report.

Table 4 provides the demographic characteristics of the respondents. Most respondents were females (91.4%), 41 to 60 years of age (72.5%), and with a high school diploma or some college education (79.7%). Almost 15% of the sample were more than 60 years old. More than 62% had been employed in the foodservice industry for 6 to 25 years; more than 41% had been employed in their current position for less than five years. The majority (83.8%) had food safety certification with ServSafe® being the most prevalent (57.8%).

Proper Cleaning and Sanitizing of Food Contact Surfaces

Proper cleaning and sanitizing was defined as not allowing raw food to come into contact with ready-to-eat foods, cleaning and/or sanitizing all food contact surfaces between each use, and cleaning and sanitizing all food contact surfaces when switching from one food preparation task to another. Both direct and indirect measures for attitudes, subjective norms, and perceived

Table 4. Characteristics of Respondents (N=408)

Characteristic	n	%[a]	Characteristic	n	%[a]
Age			*Years employed in foodservice*		
30 years or younger	30	7.4	5 or less	79	19.4
31-40 years	65	15.9	6-15	155	38.0
41-50 years	116	28.4	16-25	100	24.5
51-60 years	120	29.4	26 or more	59	14.5
60 years or older	60	14.7			
			Years employed in current position		
Gender			5 or less	170	41.7
Male	31	7.6	6-15	138	33.8
Female	373	91.4	16-25	51	12.5
			26 or more	15	3.7
Education					
High School/GED	195	47.8	*Food Safety Certification*		
Some College	130	31.9	Yes	342	83.8
Associate's Degree	45	11.0	No	54	13.2
Bachelor's Degree	29	7.1	*Which food safety certification[b]*		
Graduate Degree	4	1.0	ServSafe®	236	57.8
			Serving-It-Safe	20	4.9
			Other	56	13.7

[a] Responses may not equal 100% due to non-response to a question.

[b] Respondents could select multiple answers

behavioral control related to properly cleaning and sanitizing food contact surfaces were measured.

Direct Measures

Cronbach's alpha was used to assess construct reliability among the direct measures with 0.70 as the threshold to demonstrate consistency (Cronbach, 1951). All direct measures had reliability indices that were acceptable without removing any variable from the measures. Table 5 provides the reliability coefficients.

The direct measures of behavioral intentions indicated that school nutrition employees have very high intention to properly clean and sanitize work surfaces ($M = 6.9 \pm 0.31$) (Table 5). They also had positive attitudes ($M = 6.8 \pm 0.47$), high subjective norms ($M = 6.8 \pm 0.40$), and perceived high levels of control ($M = 6.4 \pm 1.07$) over properly cleaning and sanitizing work surfaces. Median values for direct measures related to proper cleaning and sanitizing of food contact surfaces are presented in Appendix E.

Indirect Measures

The results for indirect measures are presented in Table 6. For behavioral beliefs, positive scores (composite mean = 52.2 ± 16.4, with a range of -84 to +84) indicate that employees favor properly cleaning and sanitizing food contact surfaces. Employees generally perceived that properly cleaning and sanitizing work surfaces will decrease the likelihood that students will get sick ($M = 20.1 \pm 4.1$) and ensure high food quality ($M = 16.8 \pm 7.0$).

Table 5. Summary of Direct Measures for Proper Cleaning and Sanitizing of Food Contact Surfaces (N=408)			
Measure (Scale)	**Mean**	**SD**	**Reliability**
Attitude[a] (Mean Composite Score = 6.8 ± 0.47)			0.81
Extremely Bad (1) – Extremely Good (7)	6.9	0.40	
Extremely Worthless (1) – Extremely Valuable (7)	6.9	0.40	
Extremely Useless (1) – Extremely Useful (7)	6.9	0.58	
Extremely Foolish (1) – Extremely Wise (7)	6.8	0.57	
Extremely Unpleasant (1) – Extremely Pleasant (7)	6.4	0.98	
Subjective Norms[b] (Mean Composite Score = 6.8 ± 0.40)			0.73
It is expected that I will properly clean and sanitize food contact surfaces.	6.9	0.31	
The people in my life whose opinions I value would want me to properly clean and sanitize food contact surfaces.	6.8	0.50	
Most people who are important to me think that I should properly clean and sanitize food contact surfaces.	6.7	0.62	
Perceived Behavioral Control[b] (Mean Composite Score = 6.4 ± 1.07)			0.72
I have complete control over properly cleaning and sanitizing food contact surfaces.	6.5	0.98	
It is mostly up to me whether I properly clean and sanitize food contact surfaces.	6.2	1.40	
Behavioral Intention[b] (Mean Composite Score = 6.9 ± 0.31)			0.84
I plan to properly clean and sanitize food contact surfaces.	6.9	0.30	
I will try to properly clean and sanitize food contact surfaces.	6.9	0.41	
I intend to properly clean and sanitize food contact surfaces.	6.9	0.34	

[a] The stem asked respondents, "For me to properly clean and sanitize food contact surfaces is _____".
[b] Scale value ranges from *Strongly Disagree (1)* to *Strongly Agree (7)*.

Table 6. Descriptive Summary Indirect Measures for Properly Cleaning and Sanitizing Food Contact Surfaces (N=408)

Belief Items	Strength Mean[a] ± SD	Evaluation Mean[b] ± SD	Overall Beliefs Mean[c] ± SD
Behavioral Beliefs ($\sum bb_i be_i = 52.2 \pm 16.4$)	bb_i *	be_i *	$bb_i be_i$ *
Decrease the likelihood that students will get sick	6.9 ± 0.3	2.9 ± 0.6	20.1 ± 4.1
Keep my students satisfied	5.8 ± 1.5	2.2 ± 1.2	14.1 ± 7.8
Ensure high food quality	6.3 ± 1.3	2.5 ± 1.1	16.8 ± 7.0
Take too much time	1.6 ± 1.4	0.1 ± 2.6	1.1 ± 5.3
Normative Beliefs ($\sum nb_i mc_i = 167.3 \pm 30.7$)	nb_i *	mc_i *	$nb_i mc_i$ *
Health inspector	7.0 ± 0.2	3.0 ± 0.2	20.7 ± 1.8
Immediate supervisor	6.9 ± 0.4	2.9 ± 0.4	20.3 ± 2.8
School nutrition director	6.9 ± 0.5	2.9 ± 0.5	20.0 ± 3.6
School Nurse	6.8 ± 0.6	2.8 ± 0.6	19.0 ± 4.7
School administrators	6.7 ± 0.7	2.7 ± 0.7	18.5 ± 5.3
Other employees	6.6 ± 0.7	2.6 ± 0.7	17.8 ± 5.5
Parents	6.6 ± 0.7	2.6 ± 0.7	18.1 ± 5.4
Teachers	6.6 ± 0.8	2.6 ± 0.8	17.9 ± 5.6
My students	6.3 ± 1.0	2.3 ± 1.0	14.7 ± 7.9
Control Beliefs ($\sum cb_i pp_i = -19.1 \pm 33.9$)	cb_i *	pp_i *	$cb_i pp_i$ *
Time	3.2 ± 2.3	-1.8 ± 1.8	-3.6 ± 8.5
Lack of supplies	2.9 ± 2.3	-2.1 ± 1.7	-3.8 ± 8.0
Access to equipment	2.9 ± 2.2	-2.1 ± 1.7	-4.0 ± 7.5
Lack of equipment	2.8 ± 2.2	-2.1 ± 1.6	-3.9 ± 7.6
Funds	2.6 ± 2.0	-2.1 ± 1.6	-3.5 ± 6.8

[a] Strength means were measured on a 1 to 7 scale.
[b] Evaluation means were measured on a 1 to 7 scale and recoded to a -3 to 3 scale for analysis purposes.
[c] Overall belief mean represents the mean of the strength of each individual item multiplied by the evaluation of that item. Possible score range from -21 to 21.
* Note: bb = Behavioral Beliefs, be = Behavioral Beliefs Evaluation, nb = Normative Beliefs, mc = Motivation to Comply, cb = Control Beliefs, pp = Perceived Power

Normative beliefs among the employees were also high (composite mean = 167.3 ± 30.7, with a range of -189 to +189). The data illustrate a strong positive social pressure to properly clean and sanitize food contact surfaces.

The highest means among normative beliefs were associated with the health inspector (M = 20.7 ± 1.8), the employee's immediate supervisor (M = 20.3 ± 2.8), and the school nutrition

director (M = 20.0 ± 3.6). Median values for indirect measures of behavioral beliefs for proper

cleaning and sanitizing of food contact surfaces are presented in Appendix E.

Overall control beliefs (the items over which employees feel they have control) all

showed a negative score, which indicates that employees do not feel they control properly

cleaning and sanitizing food contact surfaces. The overall composite mean of control beliefs

totaled -19.1 (± 33.9) with a range of scores from -105 to +105, showing a weak level of

negative control meaning the participants do not feel have control over properly cleaning and

sanitizing food contact surfaces. All scores in this area ranged from -4.0 ± 7.5 (access to

equipment) to -3.5 ± 6.8 (funds).

Theory of Planned Behavior Model Testing

Relationship among Indirect Measures to Direct Measures

Three simple linear regression models were used to examine the relationships between

the indirect measures as independent variables and their corresponding direct measures (attitude,

subjective norm, and perceived behavioral control) as dependent variables. The relationship

between the behavioral belief factors ($\sum bb_i be_i$) and the attitude mean composite score (Table 7;

F=16.3, $p \leq 0.000$) and the relationship between normative belief factors ($\sum nb_i mc_i$) and the

subjective norm mean composite score (Table 8; F=140.2, $p \leq .000$) were significant. However,

the relationship between control belief factors ($\sum cb_i pp_i$) and the perceived behavioral control

mean composite score (Table 9; F=0.747, $p \leq 0.388$) was not significant.

The significant independent variables in the model were the behavioral beliefs mean

composite score ($\beta = 0.197$, $p \leq 0.000$) and the normative beliefs mean composite score (β

=0.511, $p \leq 0.000$). Both behavioral and normative beliefs made significant contributions to

Table 7. The Regression of Behavioral Beliefs on Attitude Mean Composite Score for Proper Cleaning and Sanitizing of Food Contact Surfaces (N=405)

	Model	Sum of Squares	df	Mean Square	F	Significance
1	Regression	3.413	1	3.413	16.284	0.000
	Residual	84.473	403	0.210		
	Total	87.886	404			

	Standardized Coefficients			
	Model	Beta	t	Sig.
1	(Constant)		85.686	0.000
	Behavioral Beliefs	0.197	4.035	0.000

Table 8. The Regression of Normative Beliefs on Subjective Norm Mean Composite Score for Proper Cleaning and Sanitizing of Food Contact Surfaces (N=399)

	Model	Sum of Squares	df	Mean Square	F	Significance
1	Regression	16.116	1	16.116	140.166	0.000
	Residual	45.646	397	0.115		
	Total	61.762	398			

	Standardized Coefficients			
	Model	Beta	t	Sig.
1	(Constant)		60.713	0.000
	Normative Beliefs	0.511	11.839	0.000

Table 9. The Regression of Control Beliefs on Perceived Behavioral Control Mean Composite Score for Proper Cleaning and Sanitizing of Food Contact Surfaces (N=403)

	Model	Sum of Squares	df	Mean Square	F	Significance
1	Regression	0.860	1	0.860	0.747	0.388
	Residual	461.904	401	1.152		
	Total	462.764	402			

	Standardized Coefficients			
	Model	Beta	t	Sig.
1	(Constant)		104.185	0.000
	Control Beliefs	0.043	0.864	0.388

predicting attitudes (Adjusted $R_2 = 0.036$) and subjective norms (Adjusted $R_2 = 0.259$). Control

beliefs mean composite score was not significant in predicting perceived behavioral control. The

overall TPB model summary, including both indirect and direct measures of behavioral intention, is presented in Figure 4.

Relationship among Direct Measures and Behavioral Intention

Multiple linear regression was then used to test the relationships between the behavioral intention mean composite score (dependent variable) and the mean composite scores of attitude, subjective norm, and perceived behavioral control as independent variables. The relationship was significant (Table 10; F=88.0, $p \leq 0.000$).

The significant independent variables in the model were the subjective norm mean composite score ($\beta = 0.542$, $p \leq 0.000$) and the perceived behavioral control composite score ($\beta = 0.177$, $p \leq 0.000$). Both subjective norms and perceived behavioral control made significant contributions to predicting the intention to properly clean and sanitize food contact surfaces (Adjusted $R_2 = 0.391$). Attitude was not significant in predicting behavioral intention. The overall TPB model summary, including both indirect and direct measures of behavioral intention, is presented in Figure 4.

Results of the regression analysis indicate that intervention strategies that target attitude will not likely impact behavioral intention. However, intervention strategies that are focused on social norms and perceptions of control are strongly correlated to behavioral intention. Therefore, intervention strategies that focus on improving one or both of these constructs will more likely produce an increase in the intention to perform the behavior. Likewise, if an intervention strategy decreases the social norms or perceptions of control, a decrease in the intention to perform the behavior will occur.
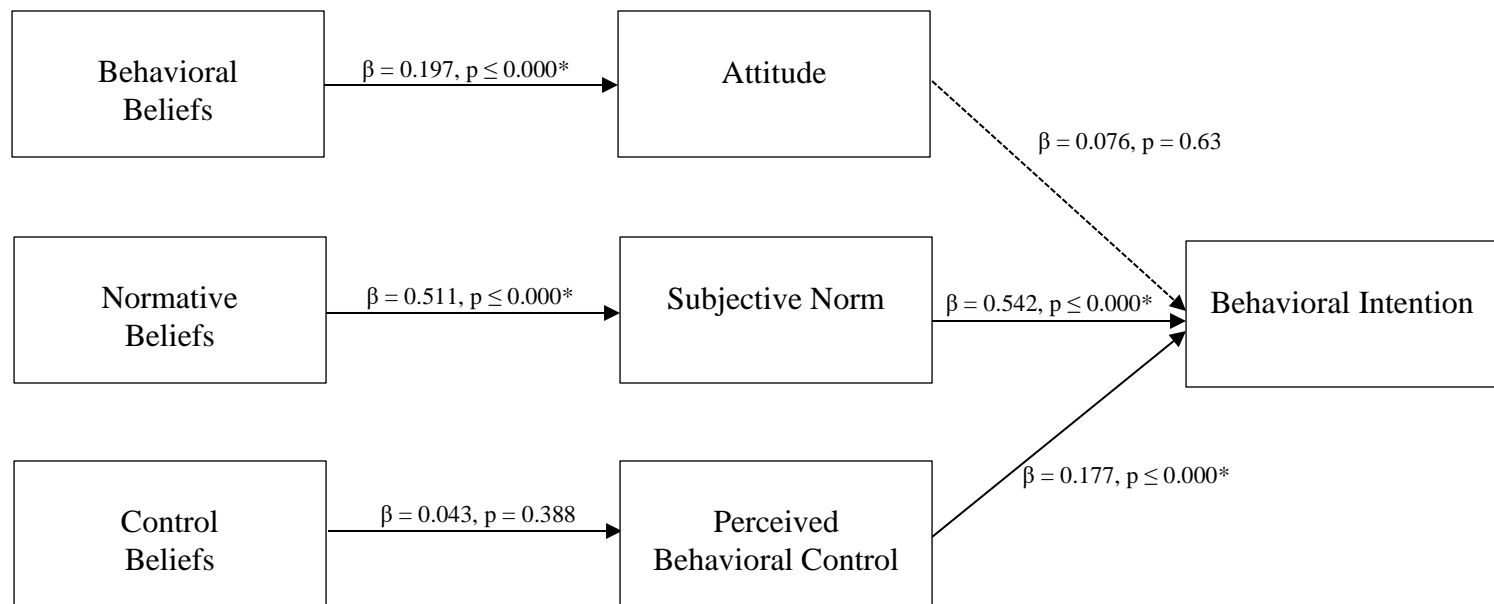
Figure 4: Summary of Simple and Multiple Linear Regressions Exploring Theory of Planned Behavior Constructs for Properly Cleaning and Sanitizing of Food Contact Surfaces. Standardized coefficients are presented. * $p \leq 0.05$

Table 10. The Regression of Direct Measures onto Behavioral Intention for Proper Cleaning and Sanitizing of Food Contact Surfaces (N=408)

	Model	Sum of Squares	df	Mean Square	F	Significance
1	Regression	15.443	3	5.148	88.014	.000
	Residual	23.629	404	0.058		
	Total	39.072	407			

	Model	Standardized Coefficients Beta	t	Sig.
1	(Constant)		13.922	0.000
	Attitude Mean Composite Score	0.076	1.867	0.063
	Subjective Norm Mean Composite Score	0.542	13.112	0.000
	Perceived Behavioral Control Mean Composite Score	0.177	4.482	0.000

Handwashing

Proper handwashing was defined as "washing with soap and hot water for 20 seconds; drying with an air dryer or single-use paper towel, washing hands before work, washing hands before putting on gloves, washing hands when food preparation tasks are interrupted or changed, and washing hands whenever they come in contact with something that might have germs". Both direct and indirect measures of attitudes, subjective norms, and perceived behavioral controls for proper handwashing were measured.

Direct Measures

Cronbach's alpha (Cronbach, 1951) was used to determine construct reliability among the direct measures with 0.70 as the threshold to demonstrate consistency. All direct measures had reliabilities that were acceptable without removing any variable from the measures. Table 11 provides the reliability coefficients.

The direct measures of behavioral intentions indicated that school nutrition employees have very high intentions to properly wash their hands (M = 6.9 ± 0.40) (Table 11). Overall, employees revealed positive attitudes (M = 6.9 ± 0.40), subjective norms (M = 6.8 ± 0.37), and

Table 11. Summary of Direct Measures for Proper Handwashing (N=408)

Measure (Scale)	Mean	SD	Reliability
Attitude[a] (Mean Composite Score = 6.9 ± 0.40)			0.82
Extremely Bad (1) – Extremely Good (7)	6.9	0.36	
Extremely Worthless (1) – Extremely Valuable (7)	6.9	0.39	
Extremely Useless (1) – Extremely Useful (7)	6.9	0.48	
Extremely Foolish (1) – Extremely Wise (7)	6.9	0.49	
Extremely Unpleasant (1) – Extremely Pleasant (7)	6.6	0.83	
Subjective Norms[b] (Mean Composite Score = 6.8 ± 0.37)			0.80
It is expected that I will use proper handwashing techniques.	6.9	0.28	
The people in my life whose opinions I value would want me to use proper handwashing techniques.	6.8	0.46	
Most people who are important to me think that I should use proper handwashing techniques.	6.8	0.53	
Perceived Behavioral Control[b] (Mean Composite Score = 6.6 ± 0.86)			0.82
I have complete control over using proper handwashing techniques.	6.7	0.82	
It is mostly up to me whether I use proper handwashing techniques.	6.6	1.04	
Behavioral Intention[b] (Mean Composite Score = 6.9 ± 0.31)			0.75
I plan to use proper handwashing techniques.	6.9	0.30	
I will try to use proper handwashing techniques.	6.9	0.41	
I intend to use proper handwashing techniques.	6.9	0.41	

[a] The stem asked respondents, "For me to use proper handwashing techniques is _____".
[b] Scale value ranges from *Strongly Disagree (1)* to *Strongly Agree (7)*.

perceived behavioral controls (M = 6.6 ± 0.86) about handwashing. Median values for direct

measures related to proper handwashing are presented in Appendix F.

Indirect Measures

The composite score for the indirect measures (Table 12) related to behavioral beliefs

was moderately high (composite mean = 55.8 ± 14.0, possible range of -84 to +84). Scores

indicate that employees are generally in favor of proper handwashing. Employees believe that

Belief Items	Strength Mean[a] ± SD	Evaluation Mean[b] ± SD	Overall Beliefs Mean[c] ± SD
Table 12. Descriptive Summary of Indirect Measures for Proper Handwashing (N=408)			
Behavioral Beliefs *($\sum bb_i be_i$ = 55.8 ± 14.0)*	bb_i*	be_i*	$bb_i be_i$*
Decrease the likelihood that students will get sick	7.0 ± 0.2	2.9 ± 0.3	20.4 ± 2.5
Ensure high food quality	6.6 ± 0.9	2.7 ± 0.7	18.1 ± 5.5
Keep my students satisfied	6.3 ± 1.1	2.4 ± 1.0	16.1 ± 6.8
Take too much time	1.6 ± 1.6	0.1 ± 2.7	1.2 ± 5.9
Normative Beliefs *($\sum nb_i mc_i$= 173.3 ± 28.1)*	nb_i*	mc_i*	$nb_i mc_i$*
Health inspector	7.0 ± 0.3	3.0 ± 0.3	20.6 ± 2.1
Immediate supervisor	6.9 ± 0.3	2.9 ± 0.3	20.3 ± 2.4
School nutrition director	6.9 ± 0.5	2.9 ± 0.5	20.0 ± 3.4
Parents	6.9 ± 3.5	2.7 ± 0.7	18.5 ± 5.1
School Nurse	6.8 ± 0.5	2.8 ± 0.5	19.7 ± 3.7
School administrators	6.8 ± 0.5	2.8 ± 0.5	19.3 ± 4.2
Other employees	6.7 ± 0.7	2.7 ± 0.7	19.0 ± 4.6
Teachers	6.7 ± 0.6	2.7 ± 0.6	18.8 ± 4.5
My students	6.5 ± 0.9	2.5 ± 0.9	17.1 ± 6.5
Control Beliefs *($\sum cb_i pp_i$ = -23.6 ± 30.2)*	cb_i*	pp_i*	$cb_i pp_i$*
Time	2.9 ± 4.0	-2.4 ± 1.3	-5.8 ± 12.7
Lack of supplies	2.6 ± 2.2	-2.5 ± 1.2	-5.3 ± 7.4
Access to equipment	2.5 ± 2.1	-2.5 ± 1.3	-2.2 ± 4.1
Lack of equipment	2.5 ± 2.1	-2.5 ± 1.2	-5.2 ± 7.1
Funds	2.4 ± 2.0	-2.5 ± 1.2	-4.9 ± 6.6

[a] Strength means were measured on a 1 to 7 scale.
[b] Evaluation means were measured on a 1 to 7 scale and recoded to a -3 to 3 scale for analysis purposes.[c] Overall belief mean represents the mean of the strength of each individual item multiplied by the evaluation of that item. Possible score range from -21 to 21.
*Note: *bb* = Behavioral Beliefs, *be* = Behavioral Beliefs Evaluation, *nb* = Normative Beliefs, *mc* = Motivation to Comply, *cb* = Control Beliefs, *pp* = Perceived Power

proper

handwashing will decrease the likelihood that students will get sick (M = 20.4 ± 2.4) and appeared to believe that proper handwashing does not take too much time (M = 1.2 ± 5.9).

Normative beliefs among this sample of employees is high (composite mean = 173.3 ± 28.1, possible range of -189 to +189). Results indicate the employees had strong positive social pressure to properly wash their hands while at work. The highest means related to normative beliefs were associated with the health inspector (M = 20.6 ± 2.1), the employee's immediate supervisor (M = 20.3 ± 2.4), and the school nutrition director (M = 20.0 ± 3.4).

Overall control beliefs (the items over which employees feel they lack control) all showed a negative score, which indicates employees do not feel they have control over the behavior of proper handwashing. The overall composite mean of control beliefs totaled -23.6 (± 30.2) with a possible scores ranging from -105 to +105, showing weak negative control. All scores in this area ranged from -2.2 ± 4.1 (access to equipment) to -5.8 ± 12.7 (time). Median values for indirect measures of behavioral beliefs for proper handwashing are presented in Appendix F.

Theory of Planned Behavior Model Testing

Three simple linear regression models were used to examine the relationships between indirect measures as independent variables and their corresponding direct measures for attitude (Table 13), subjective norm (Table 14), and perceived behavioral control (Table 15) as dependent variables. The relationship between behavioral belief factors ($\sum bb_i be_i$) and the attitude composite mean score (Table 13; F=2.029, $p \leq 0.055$) and the relationship between control belief factors ($\sum cb_i pp_i$) and the perceived behavioral control composite mean score (Table 15; F=0.019, $p \leq 0.890$) showed no significance. However, the relationship between normative belief factors ($\sum nb_i mc_i$) and the subjective norm composite score (Table 14;

F=259.1, $p \leq .000$) was significant. Therefore, subjective norms related to handwashing were predicted by the corresponding normative beliefs.

Table 13. The Regression of Behavioral Beliefs on Attitude Mean Composite Score for Proper Handwashing (N=405)

	Model	Sum of Squares	df	Mean Square	F	Significance
1	Regression	0.325	1	0.325	2.029	0.155
	Residual	64.319	402	0.160		
	Total	64.644	403			

		Standardized Coefficients		
	Model	**Beta**	**t**	**Sig.**
1	(Constant)		82.512	0.000
	Behavioral Beliefs	0.071	1.424	0.155

Table 14. The Regression of Normative Beliefs on Subjective Norm Mean Composite Score for Proper Handwashing (N=399)

	Model	Sum of Squares	df	Mean Square	F	Significance
1	Regression	21.415	1	21.415	259.080	0.000
	Residual	33.063	400	0.083		
	Total	54.478	401			

		Standardized Coefficients		
	Model	**Beta**	**t**	**Sig.**
1	(Constant)		60.391	0.000
	Normative Beliefs	0.627	16.096	0.000

Table 15. The Regression of Control Beliefs on Perceived Behavioral Control Mean Composite Score for Proper Handwashing (N=403)

	Model	Sum of Squares	df	Mean Square	F	Significance
1	Regression	0.014	1	0.014	0.019	0.890
	Residual	296.043	401	0.738		
	Total	296.057	402			

		Standardized Coefficients		
	Model	**Beta**	**t**	**Sig.**
1	(Constant)		122.457	0.000
	Control Beliefs	0.007	0.138	0.890

The significant independent variable in the model was the normative beliefs mean composite score ($\beta = 0.627$, $p \leq 0.000$). Normative beliefs made significant contributions to predicting subjective norms (Adjusted $R_2 = 0.392$). Both behavioral and control beliefs mean composite scores were not significant in predicting attitude and perceived behavioral control, respectively. The overall TPB model summary, including both indirect and direct measures of behavioral intention, is presented in Figure 5.

Multiple linear regression was then used to test the relationships between the behavioral intention mean composite score (dependent variable) and the mean composite scores of attitude, subjective norm, and perceived behavioral control as independent variables. The relationship was significant (F=88.0, $p \leq 0.000$) (Table 16).

Relationship among Direct Measures and Behavioral Intention

The significant independent variables in the model were the subjective norm mean composite score ($\beta = 0.564$, $p \leq 0.000$) and the perceived behavioral control composite score ($\beta = 0.153$, $p \leq 0.000$). Both subjective norms and perceived behavioral control contributed significantly to predicting proper handwashing (Adjusted $R_2 = 0.399$). Attitude was not significant in predicting behavioral intention. This suggests that intervention strategies that target attitude will not impact behavioral intention. However, intervention strategies focused on social norms and perceptions of control are strongly correlated to behavioral intention and increasing one or both of these constructs will produce an increase in the intention to perform the behavior. Figure 5 presents the overall TPB model summary with both indirect and direct measures of behavioral intention.
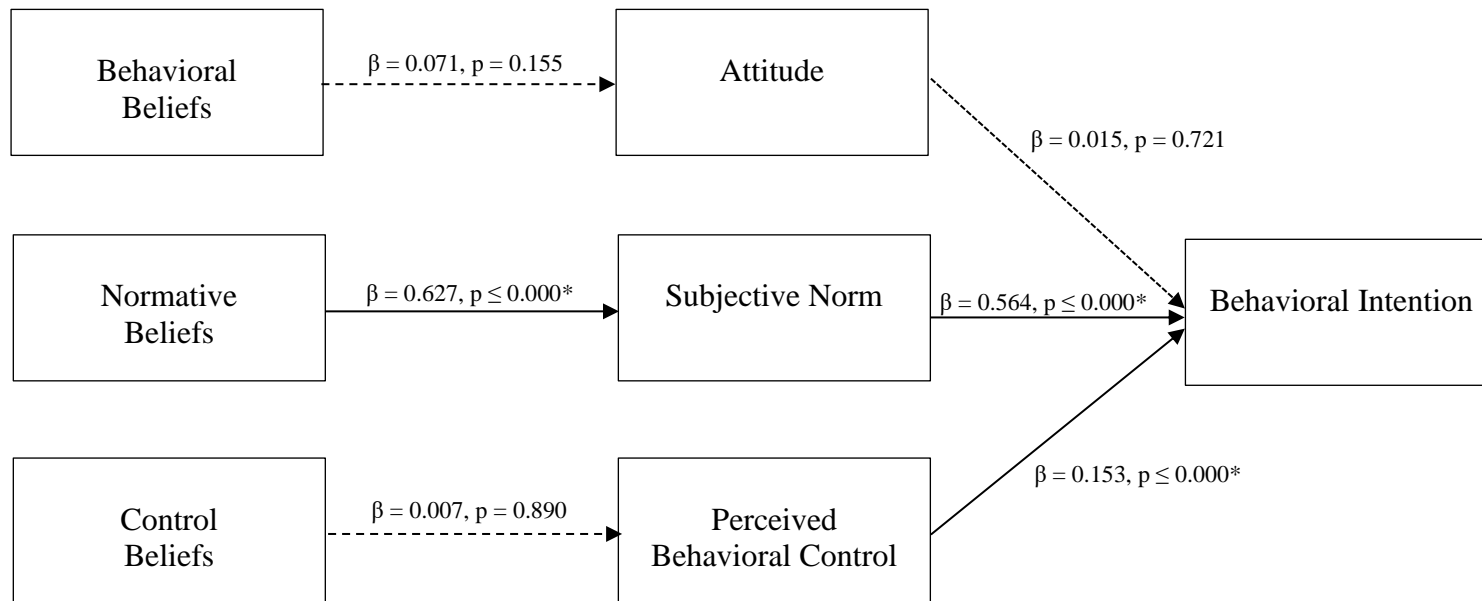
Figure 5: Summary of Simple and Multiple Linear Regressions Exploring Theory of Planned Behavior Constructs for Proper Handwashing. Standardized coefficients are presented. * *p*≤0.05

Table 16. The Regression of Direct Measures onto Behavioral Intention for Proper Handwashing (N=408)					
Model	Sum of Squares	df	Mean Square	F	Significance
1 Regression	15.262	3	5.087	90.504	.000
Residual	22.597	402	0.056		
Total	37.859	405			

Standardized Coefficients			
Model	Beta	t	Sig.
1 (Constant)		12.514	0.000
Attitude Mean Composite Score	0.015	0.358	0.721
Subjective Norm Mean Composite Score	0.564	13.241	0.000
Perceived Behavioral Control Mean Composite Score	0.153	3.764	0.000

Using a Thermometer to Check the Temperature of Food

For the food safety practice related to using a thermometer, the following definition was used: "using a thermometer to check the temperature of food at the completion of cooking, at the completion of reheating, to ensure that food stored on the hot line was at least 135°F, and to ensure that food stored on the cold line was at 41°F or less". Both direct and indirect measures of attitudes, subjective norms, and perceived behavioral controls for using a thermometer to check the temperature of food were measured.

Direct Measures

Cronbach's alpha (Cronbach, 1951) was used to determine construct reliability among the direct measures with 0.70 as the threshold for consistency. All direct measures had acceptable reliability. Table 17 presents the reliability coefficients.

The direct measures of behavioral intentions indicated that school nutrition employees have very high intention to check the food temperature with a thermometer (M = 6.9 ± 0.37) (Table 17). They also had positive attitudes (M = 6.9 ± 0.37), high subjective norms (M = 6.8 ± 0.45), and high perceived control (M = 6.5 ± 1.07) over properly using a thermometer to check

Table 17. Summary of Direct Measures for Using a Thermometer to Check the Temperature of Food (N=408)

Measure (Scale)	Mean	SD	Reliability
Attitude [a] (Composite Mean = 6.9 ± 0.37)			0.77
Extremely Bad (1) – Extremely Good (7)	6.9	0.53	
Extremely Worthless (1) – Extremely Valuable (7)	6.9	0.34	
Extremely Useless (1) – Extremely Useful (7)	6.9	0.36	
Extremely Foolish (1) – Extremely Wise (7)	6.9	0.39	
Extremely Unpleasant (1) – Extremely Pleasant (7)	6.6	0.81	
Subjective Norms [b] (Composite Mean = 6.8 ± 0.45)			0.78
It is expected that I will use a thermometer to check the temperature of food.	6.9	0.38	
The people in my life whose opinions I value would want me to use a thermometer to check the temperature of food.	6.7	0.62	
Most people who are important to me think that I should use a thermometer to check the temperature of food.	6.7	0.59	
Perceived Behavioral Control [b] (Composite Mean = 6.5 ± 1.06)			0.75
I have complete control over using a thermometer to check the temperature of food.	6.6	1.03	
It is mostly up to me whether I use a thermometer to check the temperature of food.	6.4	1.31	
Behavioral Intention [b] (Composite Mean = 6.9 ± 0.37)			0.67
I plan to use a thermometer to check the temperature of food.	6.9	0.36	
I intend to use a thermometer to check the temperature of food.	6.9	0.34	
I will try to use a thermometer to check the temperature of food.	6.8	0.65	

[a] The stem asked respondents, "For me to use a thermometer to check the temperature of food is _____".
[b] Scale value ranges from *Strongly Disagree (1) to Strongly Agree (7).*

the temperature of food. Median values for direct measures related to using a thermometer to check the temperature of food are presented in Appendix G.

Indirect Measures

The composite score for indirect measures (Table 18) related to behavioral beliefs was high (composite mean = 58.0 ± 13.4, possible range of -84 to +84). Scores on behavioral beliefs indicate that employees favor properly checking food temperature using a thermometer. Employees generally believe that using a thermometer will decrease the likelihood that students

Table 18. Descriptive Summary of Indirect Measures for Using a Thermometer to Check the Temperature of Food (N=408)

Belief Items	Strength Mean[a] ± SD	Evaluation Mean[b] ± SD	Overall Beliefs Mean[c] ± SD
Behavioral Beliefs ($\sum bb_i be_i$ = 58.0 ± 13.4)	bb_i*	be_i*	$bb_i be_i$*
Decrease the likelihood that students will get sick	6.9 ± 0.3	3.0 ± 0.2	20.6 ± 2.1
Ensure high food quality	6.8 ± 0.6	2.8 ± 0.5	19.4 ± 4.1
Keep my students satisfied	6.3 ± 1.1	2.4 ± 1.0	16.4 ± 6.9
Take too much time	1.9 ± 1.8	0.0 ± 2.7	1.6 ± 7.2
Normative Beliefs ($\sum nb_i mc_i$ = 165.6 ± 33.9)	nb_i*	mc_i*	$nb_i mc_i$*
Health inspector	6.9 ± 0.3	2.9 ± 0.3	20.5 ± 2.4
Immediate supervisor	6.9 ± 0.3	2.9 ± 0.3	20.3 ± 2.4
School nutrition director	6.9 ± 0.5	2.9 ± 0.5	20.0 ± 3.5
Other employees	6.7 ± 0.6	2.7 ± 0.6	18.8 ± 4.6
School Nurse	6.7 ± 0.7	2.7 ± 0.6	18.7 ± 5.0
School administrators	6.7 ± 0.7	2.7 ± 0.7	18.4 ± 5.3
Parents	6.5 ± 0.9	2.5 ± 0.9	16.8 ± 6.5
Teachers	6.5 ± 0.9	2.5 ± 0.9	16.9 ± 6.6
My students	6.2 ± 1.1	2.2 ± 1.1	15.2 ± 8.0
Control Beliefs ($\sum cb_i pp_i$ = -25.7 ± 32.1)	cb_i*	pp_i*	$cb_i pp_i$*
Time	2.7 ± 2.2	-2.5 ± 1.2	-5.6 ± 7.2
Lack of supplies	2.6 ± 2.2	-2.5 ± 1.3	-5.2 ± 7.5
Access to equipment	2.5 ± 2.1	-2.4 ± 1.3	-4.8 ± 7.2
Lack of equipment	2.5 ± 2.1	-2.5 ± 1.3	-4.9 ± 7.1
Funds	2.3 ± 1.9	-2.6 ± 1.1	-4.9 ± 6.3

[a] Strength means were measured on a 1 to 7 scale.
[b] Evaluation means were measured on a 1 to 7 scale and recoded to a -3 to 3 scale for analysis purposes..
[c] Overall belief mean represents the mean of the strength of each individual item multiplied by the evaluation of that item. Possible score range from -21 to 21.
*Note: *bb* = Behavioral Beliefs, *be* = Behavioral Beliefs Evaluation, *nb* = Normative Beliefs, *mc* = Motivation to Comply, *cb* = Control Beliefs, *pp* = Perceived Power

will get sick (M = 20.6 ± 2.1) and tended to believe that checking food temperature with a thermometer does not take too much time (M = 1.6 ± 7.2). Median values for indirect measures of behavioral beliefs for using a thermometer to check the temperature of food are presented in Appendix G.

Normative beliefs among the sample of employees are high (composite mean = 165.6 ± 33.9, possible range of -189 to +189). Results indicated a strong positive social pressure to use a thermometer to check food temperature. The highest means for normative beliefs were associated with the health inspector (M = 20.5 ± 2.4), the employee's immediate supervisor (M = 20.3 ± 2.4), and the school nutrition director (M = 20.0 ± 3.5).

As with the other measures, overall control beliefs (the items over which employees feel they lack control) all had a negative score. The overall composite mean of control beliefs totaled -25.7 (± 32.1) with a possible range of scores -105 to +105, showing weak negative control. All scores in this area ranged from -5.6 ± 7.2 (time) to -4.8 ± 7.2 (access to equipment).

Theory of Planned Behavior Model Testing

Relationships among Indirect Measures to Direct Measures

Three simple linear regression models were used to examine the relationships between the indirect measures as independent variables and their corresponding direct measures (attitude, subjective norm, and perceived behavioral control) as dependent variables. The relationship between the behavioral belief factors ($\sum bb_i be_i$) and the attitude composite mean score (Table 19; F=16.579, $p \leq 0.000$) and the relationship between normative belief factors ($\sum nb_i mc_i$) and the subjective norm composite score (Table 20; F=188.339, $p \leq .000$) showed significance. This indicates that the indirect measures of each construct adequately captured their underlying

constructs. However, the relationship between control belief factors ($\sum cb_i pp_i$) and the

perceived behavioral control composite mean score (Table 21; F=0.264, $p \leq 0.607$) was not

significant.

Table 19. The Regression of Behavioral Beliefs on Attitude Mean Composite Score for Using a Thermometer to Check the Temperature of Food (N=398)

Model	Sum of Squares	df	Mean Square	F	Significance
1 Regression	2.208	1	2.208	16.579	0.000
Residual	52.735	396	0.133		
Total	54.943	397			

Standardized Coefficients			
Model	Beta	t	Sig.
1 (Constant)		80.849	0.000
Behavioral Beliefs	0.200	4.072	0.000

Table 20. The Regression of Normative Beliefs on Subjective Norm Mean Composite Score for Using a Thermometer to Check the Temperature of Food (N=402)

Model	Sum of Squares	df	Mean Square	F	Significance
1 Regression	25.905	1	25.905	188.339	0.000
Residual	55.018	400	0.138		
Total	80.923	401			

Standardized Coefficients			
Model	Beta	t	Sig.
1 (Constant)		59.966	0.000
Normative Beliefs	0.566	13.724	0.000

Table 21. The Regression of Control Beliefs on Perceived Behavioral Control Mean Composite Score for Using a Thermometer to Check the Temperature of Food (N=405)

Model	Sum of Squares	df	Mean Square	F	Significance
1 Regression	0.297	1	.297	0.264	0.607
Residual	452.937	403	1.124		
Total	453.235	404			

Standardized Coefficients			
Model	Beta	t	Sig.
1 (Constant)		95.876	0.000
Control Beliefs	-0.026	-0.514	0.607

The significant independent variables in the model were the behavioral beliefs mean composite score ($\beta = 0.200$, $p \leq 0.000$) and the normative beliefs mean composite score ($\beta = 0.566$, $p \leq 0.000$). Both behavioral and normative beliefs were significant in predicting attitude (Adjusted $R_2 = 0.038$) and subjective norms (Adjusted $R_2 = 0.318$) of using a thermometer to check food temperature. Control belief was not significant in predicting perceived behavioral control. Figure 6 illustrates the overall TPB model summary including both indirect and direct measures of behavioral intention.

Relationship among Direct Measures and Behavioral Intention

Multiple linear regression was then used to test the relationships between the behavioral intention mean composite score (dependent variable) and the mean composite scores of attitude, subjective norm, and perceived behavioral control as independent variables. The relationship was significant ($F=107.184.0$, $p \leq 0.000$) (Table 22).

The significant independent variables in the model were the subjective norm mean composite score ($\beta = 0.615$, $p \leq 0.000$) and the perceived behavioral control composite score ($\beta = 0.152$, $p \leq 0.000$). Both subjective norms and perceived behavioral control were significant in predicting the behavioral intention of using a thermometer to check food temperature (Adjusted $R_2 = 0.441$). Attitude was not significant in predicting behavioral intention. Figure 6 illustrates the overall TPB model summary including both indirect and direct measures of behavioral intention.
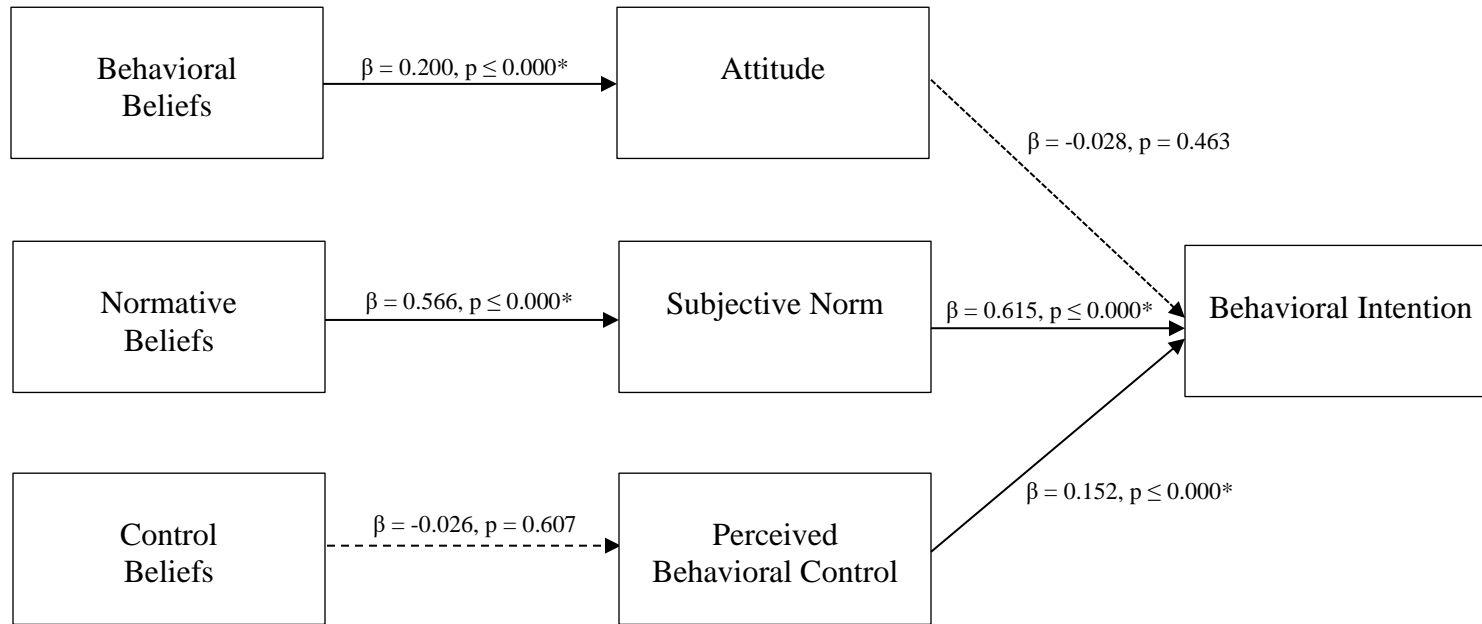
Figure 6: Summary of Simple and Multiple Linear Regressions Exploring Theory of Planned Behavior Constructs for Using a Thermometer to Check the Temperature of Food. Standardized coefficients are presented. * *p*≤0.05

Table 22. The Regression of Direct Measures onto Behavioral Intention for Using a Thermometer to Check the Temperature of Food (N=405)

Model	Sum of Squares	Df	Mean Square	F	Significance
1 Regression	24.234	3	8.078	107.184	.000
Residual	30.222	401	0.075		
Total	54.457	404			

Standardized Coefficients			
Model	Beta	t	Sig.
1 (Constant)		11.143	0.000
Attitude Mean Composite Score	-0.028	-0.734	0.463
Subjective Norm Mean Composite Score	0.615	15.419	0.000
Perceived Behavioral Control Mean Composite Score	0.152	3.916	0.000

Absolute versus Lower Intenders

Further analysis enabled comparing absolute intenders to other intenders that were not absolute. To assess differences between those who absolutely intend (behavioral belief score of 7.0 on a 7.0 scale) to perform the behavior and those who do not, a series of T-tests were conducted for each behavior. Results are presented in Table 23.

T-test results indicate which beliefs are different among those that are absolute intenders and those who are not (Table 23). Significant differences were found in most beliefs, except the control belief that limited funds makes it difficult to properly clean and sanitize food contact surfaces and the behavioral belief that it takes too much time to properly wash hands, properly clean and sanitize food contact surfaces, and use a thermometer to check the temperature of food. Future training initiatives should focus on those beliefs where significant differences were found between lower and absolute intenders. Training should avoid focusing on those beliefs (for example, taking too much time as a behavioral belief) where significance was not found.

Table 23. T-Test of Absolute and Lower Intenders across All Food Safety Practices

Belief Items	Proper Cleaning and Sanitizing of Food Contact Surfaces					Proper Handwashing					Using a Thermometer to check the Temperature of Food				
	Lower Intender (n=60)		Absolute Intender (n=348)			Lower Intender (n=57)		Absolute Intender (n=351)			Lower Intender (n=70)		Absolute Intender (n=337)		
Behavioral Beliefs															
Decrease the likelihood that students will get sick	18.88 ± 3.54		20.35 ± 4.12	*		18.88 ± 3.70		20.68 ± 2.09	*		18.67 ± 4.55		20.96 ± 0.54	*	
Ensure high food quality	15.28 ± 6.21		17.10 ± 7.07	*		15.81 ± 5.64		18.51 ± 5.44	*		17.19 ± 5.49		19.90 ± 3.53	*	
Keep my students satisfied	12.05 ± 7.10		14.49 ± 7.91	*		12.75 ± 6.85		16.59 ± 6.69	*		12.99 ± 7.35		17.12 ± 6.57	*	
Take too much time	1.56 ± 4.48		1.05 ± 5.39			2.05 ± 7.57		1.01 ± 5.60			1.19 ± 6.46		1.66 ± 7.32		
Normative Beliefs															
Health inspector	19.75 ± 3.76		20.87 ± 1.07	*		18.82 ± 4.72		20.90 ± 0.96	*		18.83 ± 4.74		20.84 ± 1.19	*	
Immediate supervisor	19.08 ± 3.96		20.51 ± 2.49	*		17.68 ± 4.38		20.72 ± 1.57	*		18.04 ± 4.26		20.79 ± 1.37	*	
School nutrition director	18.40 ± 4.60		20.25 ± 3.30	*		15.56 ± 5.16		20.44 ± 2.89	*		17.30 ± 5.51		20.52 ± 2.65	*	
School nurse	16.90 ± 5.35		19.35 ± 4.46	*		16.93 ± 5.25		20.13 ± 3.15	*		15.10 ± 6.13		19.41 ± 4.39	*	
School administrators	16.22 ± 6.43		18.86 ± 5.00	*		16.37 ± 5.63		19.76 ± 3.72	*		15.13 ± 6.17		19.08 ± 4.84	*	
Teachers	15.62 ± 6.47		18.33 ± 5.40	*		15.14 ± 5.51		19.38 ± 4.06	*		12.83 ± 6.49		17.74 ± 6.31	*	
Other employees	15.54 ± 5.88		18.18 ± 5.34	*		14.91 ± 6.38		19.60 ± 3.88	*		14.93 ± 6.29		19.61 ± 3.65	*	
Parents	14.98 ± 5.90		18.67 ± 5.07	*		14.14 ± 5.56		19.16 ± 4.63	*		12.39 ± 6.22		17.77 ± 6.20	*	
My student	11.34 ± 7.45		15.27 ± 7.80	*		12.68 ± 6.77		17.81 ± 6.16	*		10.68 ± 7.19		16.11 ± 7.83	*	
Control Beliefs															
Time	-1.45 ± 8.03		-3.91 ± 8.58	*		-2.39 ± 8.41		-6.32 ± 13.20	*		-3.06 ± 7.99		-6.18 ± 6.97	*	
Lack of supplies	-1.65 ± 8.99		-4.21 ± 7.83	*		-3.07 ± 7.51		-5.71 ± 7.35	*		-3.45 ± 8.49		-5.58 ± 7.29	*	
Lack of equipment	-1.97 ± 7.86		-4.24 ± 7.54	*		-2.91 ± 7.34		-5.58 ± 6.98	*		-3.20 ± 7.91		-5.23 ± 6.83	*	
Funds	-2.02 ± 7.79		-3.80 ± 6.55			-2.88 ± 7.27		-5.22 ± 6.46	*		-3.13 ± 7.41		-5.27 ± 5.97	*	
Access to equipment	-2.20 ± 7.69		-4.31 ± 7.45	*		-1.02 ± 5.44		-2.36 ± 3.87	*		-2.93 ± 8.37		-5.19 ± 6.93	*	

*denotes a significant difference between lower vs. absolute intenders at the $p \leq 0.05$.

Conclusions, Recommendations, and Limitations

Conclusions

Part I: Elicitation Study

Results of the elicitation study helped in developing a questionnaire for the primary study (Part II). School nutrition employees identified salient beliefs for proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature of food. Food safety, food quality, and the health of patrons and employees were reported as advantages of performing all three behaviors. Adequate and accessible resources, training, and accountability among coworkers were identified as facilitators. Time and equipment were identified as disadvantages and barriers.

Part II: Primary Study

The positive scores within the behavioral beliefs indicate that employees generally favor proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature of food. They believe these behaviors might decrease the likelihood of students getting sick and these behaviors do not require too much time. Behavioral beliefs contributed significantly to the prediction of attitude for properly cleaning and sanitizing food contact surfaces and using a thermometer to check the temperature of food, but not for proper handwashing. This result could be due to the fact that school nutrition employees already held high behavioral beliefs towards properly washing hands.

Employees felt strong positive social pressures to perform the three practices. For the three practices, meeting the expectations of the health inspector appeared to be most important,

followed by the immediate supervisor and the school nutrition director. Normative beliefs

contributed significantly to predicting subjective norms for all three food safety practices.

Employees also identified barriers to proper cleaning and sanitizing of food contact

surfaces, proper handwashing, and using a thermometer to check the temperature of food. The

main barriers identified for proper cleaning and sanitizing of food contact surfaces were access

and lack of equipment. For proper handwashing and using a thermometer to check the

temperature of food, the two main barriers identified were time and lack of supplies. Control

beliefs did not contributed significantly to predicting perceived behavioral controls for all three

food safety practices.

Subjective norms and perceived behavioral controls contributed significantly to

predicting the three behaviors. Attitude was not a good predictor of the behavioral intention.

For Phase II, three videos will be developed using the results of the primary study (Part

II) of Phase I. These videos will refer to the three identified food safety practices (proper

handwashing, proper cleaning and sanitizing of food contact surfaces, and using a thermometer

to check the temperature of food). During Phase II, observations will be conducted before and

after school nutrition employees attend a food safety training. Half of the employees will attend

a control group training and the other half will attend an experimental group training that

incorporates the three videos.

Recommendations

This study and the recommendations reflect previous research from the restaurant

foodservice sector that underscored how employee knowledge affected appropriate food safety

behavior (Green & Selman, 2005; Roberts et al., 2008). However, knowledge is not the only

element to improving employee behaviors and creating noticeable behavioral changes. This study provides the first theory-based investigation of how attitudes, subjective norms, and perceived behavioral controls affect food safety behaviors, specifically in school nutrition environments.

Recommendations for Educational Resources

Research indicates that people will intend to perform a behavior when they see it as positive, when they believe that people important to them think they should perform that behavior, and when they perceive little to no control barriers. In this sample, employees already held very positive attitudes about food safety practices. The strongest predictor of behavioral intent was the normative and control beliefs held by employees.

To elicit measurable change in food safety behaviors among employees, we recommend using emotional and motivational strategies, such as a storytelling approach, to educate foodservice employees. Specifically, these strategies should focus on normative and control beliefs as these were found to be the strongest predictors of behavior. Realistic and dramatic stories involving various stakeholders can help emphasize the importance of food safety and reducing risk, integrating the perspectives of those whom the school nutrition employee respects, including the school nutrition director, supervisor, or health inspector. This kind of education should reinforce the positive normative beliefs that employees hold and help to alleviate any falsely held control beliefs.

General Recommendations

Interventions should emphasize the leadership exhibited by school nutrition directors, managers, and/or supervisor as role models. Individuals holding these positions are responsible for ensuring employees have the necessary resources, such as accessible and adequate facilities

and equipment, for properly performing their food safety tasks. Interventions should also stress the importance of following practices recommended by the health inspector. Because the health inspector was considered as the most important normative belief, it is evident that the employees value and respect the health inspector's opinion and would strive to follow practices he/she might recommend.

Limitations

A notable limitation of the study is the low response rate for the study; only 10.6% of the sample provided useable responses. However, according to Dillman (2007), the number of completed responses obtained (408) would still achieve a 95% confidence level with a +/- 5% sampling error. The response rate is also comparable to previous research conducted by the Center, where response rates of 7% (Sneed & Patten, 2014), 9% (Sauer, Roberts, Sneed, Patten, & Tao, 2016), and 14% (Grisamore & Roberts, 2014) were obtained. The generalizability of the findings is improved given the standardization and homogeneity of practices and procedures found across schools, regardless of location or size. For example, school nutrition programs practices are homogenous given national compliance with the standards found within the Child Nutrition and WIC Reauthorization legislation (Child Nutrition and WIC Reauthorization Act of 2004, 2004; Healthy, Hunger-Free Kids Act of 2010, 2010).

At the beginning of each section of the questionnaire, the food safety practice within that section is clearly defined for the respondent. It is evident that the questions within the section refer to the specific food safety practice. One incidental limitation that must be noted is that stems to three questions were incorrectly stated (Appendix B, Question 13, 21, and 22). Within the handwashing section, one stem referred to proper cleaning and sanitizing. Within the use of thermometer section, one stem referred to proper cleaning and sanitizing and one stem referred

to handwashing. As mentioned, these questions were in the sections that clearly outlined the specific behavior. . None of the pilot study participants noted the incorrect wording, nor was it noted by any of the participants in the study itself and the alpha coefficient for this variable was also strong, which indicated that participants likely did not notice the incorrect wording included within the stem.

An additional limitation is the method used to collect the data. As identified in the demographic table, over 70% of respondents were 40 years of age or older. It is possible that the written survey yielded a higher response among older employees. An online data collection method might have yielded a higher response rate from younger respondents (Evans & Mathur, 2005; Kaplowitz, Hadlock & Levine; 2004; Wright, 2005).

The data contained within this study are also self-reported, which contain several limitations, including selective memory, attribution, and exaggeration. Further research should explore direct observational methods that do not rely on self-reported data (Kormos & Gifford, 2014).

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Appendix A:

Elicitation Study Instruments

Part I: What about you?

What is your gender?

_____Female

_____Male

What is your age range?

_____18 - 20 years old

_____21 - 29 years old

_____30 - 39 years old

_____40 - 49 years old

_____50 - 59 years old

_____60 years old or older

Which of the follow best describes your education level?

_____some high school

_____high school diploma

_____some college

_____Bachelor's degree

_____Graduate degree

What is your current work status?

_____Full-time

_____Part-time

How long have you worked in any type of foodservice?

_____Less than 1 year

_____1 - 3 years

_____4 - 7 years

_____8 - 12 years

_____13 - 20 years

_____Over 20 years

How long have you worked at your current job?

_____Less than 1 year

_____1 - 3 years

_____4 - 7 years

_____8 - 12 years

_____13 - 20 years

_____Over 20 years

Have you ever received <u>on-the-job training</u> about food safety?

_____Yes

_____No

If yes, which topics have been included in the <u>on-the-job training</u> you have received? (check all that apply)

_____Proper handwashing

_____Preventing cross contamination

_____Temperature control

_____None of the above

Have you previously completed a food handlers course?

_____Yes

_____No

Do you have a current food safety certification through a program approved by the Conference on Food Protection (e.g.

ServSafe®)?

_____Yes

_____No

Thank you.

FOCUS GROUP: Moderator Introduction Guide

Changing Food Safety Practices of School Nutrition Employees

Welcome to our focus group session this afternoon. My name is _____ and I will be your discussion facilitator this afternoon, _____ will be with us today as the assistant moderator, taking notes and assisting us with anything we might need.

First and foremost thank you for coming today. Before we begin with some ground rules, are there any questions you have regarding the questionnaire or consent form? *(allow at least 60 seconds for formulation of questions).*

I would like to discuss a few ground rules to make our time together most productive and enjoyable:

Ground Rule #1: All information, thoughts, and views shared are to be confidential and anonymous. Therefore, I ask that you please not share this discussion with others. You will see a name card in front of you; this is your pseudonym for our focus group discussion. Please use these when addressing other members of the group (even if you know their real name).

Ground Rule #2: Everyone's ideas and inputs are valuable. Please allow for everyone to give input and share their thoughts. There are no "right or wrong" answers. If I have not heard from you in awhile, I will interject and ask what you think about the topic being discussed. On the other hand, if someone is dominating the conversation, I will also interject and ask for someone else to give their thoughts.

Ground Rule #3: Our focus of discuss will be on your opinion of safe food handling practices and perceived barriers to implementing food safety training at work. It is not to be a critique or criticism of the food safety practices, but rather a focus on some of the barriers you perceive to follow food safety practices.

Are there any questions? *(After all questions have been answered, ask participants to take a look at their name card and introduce themselves using their pseudonym).*

Proper Handling of Food & Work Surfaces:

The first food safety task we are going to discuss is **PROPER HANDLING OF FOOD AND WORK SURFACES BY**:
Not allowing raw food to come into contact with ready-to-eat foods.
Cleaning and sanitizing all food contact surfaces (hands/gloves, countertops, cutting surfaces, equipment, dishes & utensils) between each use.
Cleaning and sanitizing all food contact surfaces when switching from one food preparation task to another.

What are some good things that could result from proper handling of food and work surfaces through this practice?

What are some reasons why you or other employees would want to do it?

What are some bad things that could result from proper handling of food and work surfaces through this practice?

What are some reasons why you or other employees might not want to do it?

What makes (or would make) it easier for you (or other employees) to properly handle food and work surfaces through this practice?

What makes it difficult for you (or other employees) to properly handle food and work surfaces through this practice?

Handwashing:

The next food safety task we are going to discuss is **PROPER HANDWASHING** BY:
Washing with soap and hot water for 20 seconds
Drying (with an air dryer or single use paper towels)
Washing hands before work
Washing hands before putting on gloves
Washing hands when food preparation tasks are interrupted or changed
Washing hands whenever they come in contact with something that might have germs (food, the bathroom, coughing, or touching body parts)

What are some good things that could result from proper handwashing through this practice?

What are some reasons why you or other employees would want to do it?

What are some bad things that could result from proper handwashing through this practice?

What are some reasons why you or other employees might not want to do it?

What makes (or would make) it easier for you (or other employees) to properly wash hands through this practice?

What makes it difficult for you (or other employees) to properly wash hands through this practice?

Thermometer Use:

The next food safety task we are going to discuss is **USING A THERMOMETER TO CHECK THE TEMPERATURE OF FOOD**:
At the completion of cooking (various temperatures)
At the completion of reheating (to 165 degrees)
To ensure that food stored on the hot line is at least 135 degrees
To ensure that food stored on the cold line is 41 degrees or less

What are some good things that could result from using a thermometer to check the temperature of foods through this practice?

What are some reasons why you or other employees would want to do it?

What are some bad things that could result from using a thermometer to check the temperature of foods through this practice?

What are some reasons why you or other employees might not want to do it?

What makes (or would make) it easier for you (or other employees) to use a thermometer to check the temperature of foods through this practice?

What makes it difficult for you (or other employees) to use a thermometer to check the temperature of foods through this practice?

Normative Beliefs:

List all the people that you think care (either approve or disapprove) about whether or not you and other employees follow these food safety practices (proper handling of food and work surfaces, proper handwashing, and using a thermometer to check the temperature of food).

Changing Food Safety Practices of School Nutrition Employees

Date: _____   Assistant Moderator: _____

Location: _____   Moderator: _____

The assistant moderator should conduct a debrief session with the moderator after the focus group. This should begin 15 to 30 minutes after the focus group ends. Debriefing will help to identify any non-verbal communication, such as gestures and facial expressions. Debriefing also helps to identify any issues that came up during the discussion, and new topics that arose during the focus group.

What are some of the main themes that emerged from this focus group?

What did participants say that was unclear or confusing to you?

Are there any observations that we should addressed that would not be evident from reading a transcript of the discussion (e.g., group dynamic, individual behaviors)

Where there any problems that you encountered? (Logistics, behaviors of individuals, questions that were confusing)

What questions or issues are there for follow up in the future?

Any suggestion form the assistant moderator to the moderator and vice versa.

Appendix B:

Primary Study Cover Letter & Questionnaire

School Foodservice Employees' Attitudes and Knowledge of Performing Behaviors related to Food Safety

The Center of Excellence for Food Safety Research in Child Nutrition Programs

Kansas State University

KANSAS STATE UNIVERSITY

The Center of Excellence for **FOOD SAFETY RESEARCH IN CHILD NUTRITION PROGRAMS**

Dear Participant,

Foodborne illnesses continue to account for a large number of illnesses, hospitalizations, and deaths each year in the United States. Given that over 2.2 billion meals and snacks are served each year through the National School Lunch Program (NSLP), School Breakfast Program, Summer Food Service, After School Snack Programs, and the Child and Adult Care Feeding Programs the opportunity exists for large-scale foodborne outbreaks to occur with serious complications within the school environment. Employee knowledge and attitudes are important factors that protect schools and children from foodborne illness outbreaks. The development of a comprehensive training model that utilizes existing educational materials and training along with improved pedagogical methods may help to break the barriers to food safety implementation in schools.

The goals of this project are to implement a training program to overcome employee barriers to food safety implementation and to increase the amount of food safety practices utilized in school foodservice operations. The end results would be an increase in the food safety practices utilized in child nutrition operations and a decrease in the incidences of foodborne illnesses. It is understood that by completing the survey that follows, you are consenting to be in this research study, "Changing Food Safety Practices of School Foodservice Employees".

Your participation is completely voluntary and you may discontinue at any time without penalty. Individual responses will not be identifiable and all results will be reported as group data. It may take about 15 minutes to complete all questions. Below, you will be asked to respond to questions about your attitudes and knowledge of performing behaviors relating to food safety practices. ***Please carefully read each question and do not leave any items blank***. Please be assured that your responses will be confidential and all data will be reported as group data.

Your response is very important to the success of this study and to the quality of future food safety education. Should you have any questions about the study, please contact Kevin Roberts at (785) 532-2213. If you have any questions about the rights of individuals in this study or about the way it is conducted, you may contact the University Research Compliance Office at (785) 532-3224. Thank you for your time and assistance.

Cordially,

Kevin Roberts, Ph.D.
Associate Professor
Director, Hospitality Management Program

In this questionnaire you will be asked to respond to questions about your attitudes and knowledge of performing behaviors related to three food safety practices: **proper cleaning and sanitizing of food contact surfaces, proper handwashing, and using a thermometer to check the temperature of food**. Please read each question carefully. **Some of the questions may appear to be similar but they address different issues and practices.**

The first food safety task we are going to discuss is **PROPER CLEANING AND SANITIZING OF FOOD CONTACT SURFACES BY**:

- Not allowing raw food to come into contact with ready-to-eat foods.
- Cleaning and/or sanitizing all food contact surfaces (hands, countertops, cutting surfaces, equipment, dishes & utensils) between each use.
- Cleaning and sanitizing all food contact surfaces when switching from one food preparation task to another.

1. **Proper cleaning and sanitizing of food contact surfaces will _____**

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Keep my students satisfied.	1	2	3	4	5	6	7
Decrease the likelihood that students will get sick.	1	2	3	4	5	6	7
Ensure high food quality.	1	2	3	4	5	6	7
Take too much time.	1	2	3	4	5	6	7

2. **How important is each of the following items to you for using proper cleaning and sanitizing of food contact surfaces?**

Statement	Extremely Unimportant	Unimportant	Slightly Unimportant	Neutral	Slightly Important	Important	Extremely Important
Keeping my students satisfied.	1	2	3	4	5	6	7
Decreasing the likelihood that students will get sick.	1	2	3	4	5	6	7
Ensuring high food quality.	1	2	3	4	5	6	7
Taking extra time.	1	2	3	4	5	6	7

3. _____ think(s) that I should use proper cleaning and sanitizing of food contact surfaces.

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
My immediate supervisor	1	2	3	4	5	6	7
The School Nutrition Director	1	2	3	4	5	6	7
Other employees	1	2	3	4	5	6	7
My students	1	2	3	4	5	6	7
Parents	1	2	3	4	5	6	7
Teachers	1	2	3	4	5	6	7
The school nurse	1	2	3	4	5	6	7
School administrators	1	2	3	4	5	6	7
The health inspector	1	2	3	4	5	6	7

4. Generally speaking, how much do you care what _____ think(s) you should do in regards to properly cleaning and sanitizing food contact surfaces?

Statement	Not at all	Barely	A Little	Neutral	Somewhat	Much	Very Much
Your immediate supervisor	1	2	3	4	5	6	7
The School Nutrition Director	1	2	3	4	5	6	7
Other employees	1	2	3	4	5	6	7
My students	1	2	3	4	5	6	7
Parents	1	2	3	4	5	6	7
Teachers	1	2	3	4	5	6	7
The school nurse	1	2	3	4	5	6	7
School administrators	1	2	3	4	5	6	7
The health inspector	1	2	3	4	5	6	7

5. _____ makes it more difficult for me to properly clean and sanitize food contact surfaces:

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Limited time	1	2	3	4	5	6	7
Limited funds	1	2	3	4	5	6	7
Lack of proper equipment	1	2	3	4	5	6	7
Lack of access to proper equipment	1	2	3	4	5	6	7
Lack of available supplies	1	2	3	4	5	6	7

6. **How often does _____ affect you from properly cleaning and sanitizing food contact surfaces?**

Statement	Very Rarely	Rarely	Slightly Rarely	Neutral	Slightly Frequently	Frequently	Very Frequently
Limited time	1	2	3	4	5	6	7
Limited funds	1	2	3	4	5	6	7
Lack of proper equipment	1	2	3	4	5	6	7
Lack of access to proper equipment	1	2	3	4	5	6	7
Lack of available supplies	1	2	3	4	5	6	7

7. **Each pair of (A) and (B) words are opposites. Please complete the following statement with the appropriate item: "For me to properly clean and sanitize food contact surfaces is _____."**

(A) Extremely Bad	1	2	3	4	5	6	7	(B) Extremely Good
(A) Extremely Worthless	1	2	3	4	5	6	7	(B) Extremely Valuable
(A) Extremely Useless	1	2	3	4	5	6	7	(B) Extremely Useful
(A) Extremely Unpleasant	1	2	3	4	5	6	7	(B) Extremely Pleasant
(A) Extremely Foolish	1	2	3	4	5	6	7	(B) Extremely Wise

8. **Please respond to the following questions and chose the most appropriate answer.**

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Most people who are important to me think that I should properly clean and sanitize food contact surfaces.	1	2	3	4	5	6	7
I plan to properly clean and sanitize food contact surfaces.	1	2	3	4	5	6	7
It is expected that I will properly clean and sanitize food contact surfaces.	1	2	3	4	5	6	7
The people in my life whose opinions I value would want me to properly clean and sanitize food contact surfaces.	1	2	3	4	5	6	7
It is mostly up to me whether I properly clean and sanitize food contact surfaces.	1	2	3	4	5	6	7
I will try to properly clean and sanitize food contact surfaces.	1	2	3	4	5	6	7
I have complete control over the use of proper cleaning and sanitizing of food contact surfaces.	1	2	3	4	5	6	7
I intend to properly clean and sanitize food contact surfaces.	1	2	3	4	5	6	7

The next food safety task we are going to discuss is **PROPER HANDWASHING** BY:

- Washing with soap and hot water for 20 seconds
- Drying (with an air dryer or single use paper towels)
- Washing hands before work
- Washing hands before putting on gloves
- Washing hands when food preparation tasks are interrupted or changed
- Washing hands whenever they come in contact with something that might have germs (food, the bathroom, coughing, or touching body parts)

9. **Proper handwashing techniques will _____.**

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Keep my students satisfied.	1	2	3	4	5	6	7
Decrease the likelihood that students will get sick.	1	2	3	4	5	6	7
Ensure high food quality.	1	2	3	4	5	6	7
Take too much time.	1	2	3	4	5	6	7

10. **How important is each of the following items to you in relation to using proper handwashing techniques?**

Statement	Extremely Unimportant	Unimportant	Slightly Unimportant	Neutral	Slightly Important	Important	Extremely Important
Keep my students satisfied	1	2	3	4	5	6	7
Decrease the likelihood that students will get sick.	1	2	3	4	5	6	7
Ensure high food quality.	1	2	3	4	5	6	7
Taking extra time	1	2	3	4	5	6	7

11. _____ think(s) that I should use proper handwashing techniques.

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
My immediate supervisor	1	2	3	4	5	6	7
The School Nutrition Director	1	2	3	4	5	6	7
Other employees	1	2	3	4	5	6	7
My students	1	2	3	4	5	6	7
Parents	1	2	3	4	5	6	7
Teachers	1	2	3	4	5	6	7
The school nurse	1	2	3	4	5	6	7
School administrators	1	2	3	4	5	6	7
The health inspector	1	2	3	4	5	6	7

12. Generally speaking, how much do you care what _____ think(s) you should do?

Statement	Not at all	Barely	A Little	Neutral	Somewhat	Much	Very Much
Your immediate supervisor	1	2	3	4	5	6	7
The School Nutrition Director	1	2	3	4	5	6	7
Other employees	1	2	3	4	5	6	7
My students	1	2	3	4	5	6	7
Parents	1	2	3	4	5	6	7
Teachers	1	2	3	4	5	6	7
The school nurse	1	2	3	4	5	6	7
School administrators	1	2	3	4	5	6	7
The health inspector	1	2	3	4	5	6	7

13. _____ makes it more difficult for me to properly wash my hands:

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Limited time	1	2	3	4	5	6	7
Limited funds	1	2	3	4	5	6	7
Lack of proper equipment	1	2	3	4	5	6	7
Lack of access to proper equipment techniques.	1	2	3	4	5	6	7
Lack of available supplies	1	2	3	4	5	6	7

14. How often does _____ prevent(s) you from using proper handwashing techniques?

Statement	Very Rarely	Rarely	Slightly Rarely	Neutral	Slightly Frequently	Frequently	Very Frequently
Limited time	1	2	3	4	5	6	7
Limited funds	1	2	3	4	5	6	7
Lack of proper equipment	1	2	3	4	5	6	7
Lack of access to proper equipment	1	2	3	4	5	6	7
Lack of available supplies	1	2	3	4	5	6	7

15. Each pair of (A) and (B) words are opposites. Please complete the following statement with the appropriate item: "For me to use proper handwashing techniques is _____."

(A) Extremely Bad	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**(B) Extremely Good**
(A) Extremely Worthless	1	2	3	4	5	6	7	(B) Extremely Valuable
(A) Extremely Useless	1	2	3	4	5	6	7	(B) Extremely Useful
(A) Extremely Unpleasant	1	2	3	4	5	6	7	(B) Extremely Pleasant
(A) Extremely Foolish	1	2	3	4	5	6	7	(B) Extremely Wise

16. Please respond to the following questions and chose the most appropriate answer.

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Most people who are important to me think that I should use proper handwashing techniques.	1	2	3	4	5	6	7
I plan to use proper handwashing techniques.	1	2	3	4	5	6	7
It is expected that I will use proper handwashing techniques.	1	2	3	4	5	6	7
The people in my life whose opinions I value would want me to use proper handwashing techniques.	1	2	3	4	5	6	7
It is mostly up to me whether I use proper handwashing techniques.	1	2	3	4	5	6	7
I will try to use proper handwashing techniques.	1	2	3	4	5	6	7
I have complete control over using proper handwashing techniques.	1	2	3	4	5	6	7
I intend to use proper handwashing techniques.	1	2	3	4	5	6	7

The next food safety task we are going to discuss is **USING A THERMOMETER TO CHECK THE TEMPERATURE OF FOOD**:

- At the completion of cooking (various temperatures)
- At the completion of reheating (to 165 degrees)
- To ensure that food stored on the hot line is at least 135 degrees
- To ensure that food stored on the cold line is 41 degrees or less

17. **Using a thermometer to check the temperature of food will _____**

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Keep my students satisfied.	1	2	3	4	5	6	7
Decrease the likelihood that students will get sick.	1	2	3	4	5	6	7
Ensure high food quality.	1	2	3	4	5	6	7
Take too much time.	1	2	3	4	5	6	7

18. **How important is each of the following items to you for using a thermometer to check the temperature of food?**

Statement	Extremely Unimportant	Unimportant	Slightly Unimportant	Neutral	Slightly Important	Important	Extremely Important
Keeping my students satisfied.	1	2	3	4	5	6	7
Decreasing the likelihood that students will get sick.	1	2	3	4	5	6	7
Ensuring high food quality.	1	2	3	4	5	6	7
Taking extra time.	1	2	3	4	5	6	7

19. _____ think(s) that I should use a thermometer to check the temperature of food.

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
My immediate supervisor	1	2	3	4	5	6	7
The School Nutrition Director	1	2	3	4	5	6	7
Other employees	1	2	3	4	5	6	7
My students	1	2	3	4	5	6	7
Parents	1	2	3	4	5	6	7
Teachers	1	2	3	4	5	6	7
The school nurse	1	2	3	4	5	6	7
School administrators	1	2	3	4	5	6	7
The health inspector	1	2	3	4	5	6	7

20. Generally speaking, how much do you care what _____ think(s) you should do?

Statement	Not at all	Barely	A Little	Neutral	Somewhat	Much	Very Much
Your immediate supervisor	1	2	3	4	5	6	7
The School Nutrition Director	1	2	3	4	5	6	7
Other employees	1	2	3	4	5	6	7
The students	1	2	3	4	5	6	7
The school nurse	1	2	3	4	5	6	7
Parents	1	2	3	4	5	6	7
Teachers	1	2	3	4	5	6	7
School administrators	1	2	3	4	5	6	7
The health inspector	1	2	3	4	5	6	7

21. _____ makes it more difficult for me to use a thermometer to check the temperature of food:

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Limited time	1	2	3	4	5	6	7
Limited funds	1	2	3	4	5	6	7
Lack of proper equipment	1	2	3	4	5	6	7
Lack of access to proper equipment	1	2	3	4	5	6	7
Lack of available supplies	1	2	3	4	5	6	7

22. **How often does _____ prevent(s) you from using use a thermometer to check the temperature of food?**

Statement	Very Rarely	Rarely	Slightly Rarely	Neutral	Slightly Frequently	Frequently	Very Frequently
Limited time	1	2	3	4	5	6	7
Limited funds	1	2	3	4	5	6	7
Lack of proper equipment	1	2	3	4	5	6	7
Lack of access to proper equipment	1	2	3	4	5	6	7
Lack of available supplies	1	2	3	4	5	6	7

23. **Each pair of (A) and (B) words are opposites. Please complete the following statement with the appropriate item: "For me to use a thermometer to check the temperature of food is _____."**

(A) Extremely Bad	1	2	3	4	5	6	7	**(B) Extremely Good**
(A) Extremely Worthless	1	2	3	4	5	6	7	(B) Extremely **Valuable**
(A) Extremely Useless	1	2	3	4	5	6	7	(B) Extremely **Useful**
(A) Extremely Unpleasant	1	2	3	4	5	6	7	(B) Extremely **Pleasant**
(A) Extremely Foolish	1	2	3	4	5	6	7	(B) Extremely **Wise**

24. **Please respond to the following questions and chose the most appropriate answer.**

Statement	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
Most people who are important to me think that I should use a thermometer to check the temperature of food.	1	2	3	4	5	6	7
I plan to use a thermometer to check the temperature of food.	1	2	3	4	5	6	7
It is expected that I will use a thermometer to check the temperature of food.	1	2	3	4	5	6	7
The people in my life whose opinions I value would want me to use a thermometer to check the temperature of food.	1	2	3	4	5	6	7
It is mostly up to me whether I use a thermometer to check the temperature of food.	1	2	3	4	5	6	7
I will try to use a thermometer to check the temperature of food.	1	2	3	4	5	6	7
I have complete control over using a thermometer to check the temperature of food.	1	2	3	4	5	6	7
I intend to use a thermometer to check the temperature of food.	1	2	3	4	5	6	7

Demographic Information

25. What is your gender?

_____ Male

_____ Female

26. What is your age? _____ years

27. Which of the following best describes your highest education level?

_____ High School Degree or equivalent

_____ Some College

_____ Associate's Degree

_____ Bachelor's Degree

_____ Graduate Degree

28. Do you have a food safety certification?

_____ Yes

_____ No

29. Which food safety certification do you have? (Select all that apply)

_____ ServSafe®

_____ Serving it Safe®

_____ Other, please specify: _____

30. How many years have you been employed in foodservice?

_____ Years

31. How long have you been employed at your current position in foodservice?

_____ years _____ months

Thank you for your time and input!

Close the questionnaire and seal with labels top, bottom, and side. Return the questionnaire to your School Nutrition Director.
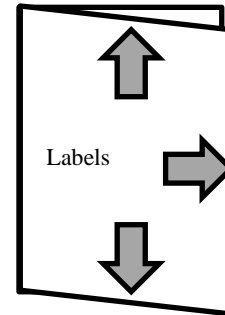
Labels

Table B1. Summary of Questionnaire Constructs, Scales, and Formula Components		
Measure	**Question #**	**Scale**
Direct Measures		
BI[*]	8B. I plan to properly clean and sanitize food contact surfaces.	1-7[a]
BI[*]	8F. I will try to properly clean and sanitize food contact surfaces.	1-7[a]
BI[*]	8H. I intend to properly clean and sanitize food contact surfaces.	1-7[a]
BI[*]	16B. I plan to use proper handwashing techniques.	1-7[a]
BI[*]	16F. I will try to use proper handwashing techniques.	1-7[a]
BI[*]	16H. I intend to use proper handwashing techniques.	1-7[a]
BI[*]	24B. I plan to use a thermometer to check the temperature of food.	1-7[a]
BI[*]	24F. I will try to use a thermometer to check the temperature of food.	1-7[a]
BI[*]	24H. I intend to use a thermometer to check the temperature of food.	1-7[a]
ATT[*]	7. Each pair of (A) and (B) words are opposites. Please complete the following statement with the appropriate item: "For me to properly clean and sanitize food contact surfaces is _____."	1-7[b]
ATT[*]	15. Each pair of (A) and (B) words are opposites. Please complete the following statement with the appropriate item: "For me to use proper handwashing techniques is _____."	1-7[b]
ATT[*]	23. Each pair of (A) and (B) words are opposites. Please complete the following statement with the appropriate item: "For me to use a thermometer to check the temperature of food is _____."	1-7[b]
SN[*]	8A. Most people who are important to me think that I should properly clean and sanitize food contact surfaces.	1-7[a]
SN[*]	8C. It is expected that I will properly clean and sanitize food contact surfaces.	1-7[a]
SN[*]	8D. The people in my life whose opinions I value would want me to properly clean and sanitize food contact surfaces.	1-7[a]
SN[*]	16A. Most people who are important to me think that I should use proper handwashing techniques.	1-7[a]
SN[*]	16C. It is expected that I will use proper handwashing techniques.	1-7[a]
SN[*]	16D. The people in my life whose opinions I value would want me to use proper handwashing techniques.	1-7[a]
SN[*]	24A. Most people who are important to me think that I should use a thermometer to check the temperature of food.	1-7[a]
SN[*]	24C. It is expected that I will use a thermometer to check the temperature of food.	1-7[a]
SN[*]	24D. The people in my life whose opinions I value would want me to use a thermometer to check the temperature of food.	1-7[a]
PBC[*]	8E. It is mostly up to me whether I properly clean and sanitize food contact surfaces.	1-7[a]
PBC[*]	8G. I have complete control over the use of proper cleaning and sanitizing of food contact surfaces.	1-7[a]
PBC[*]	16E. It is mostly up to me whether I use proper handwashing techniques.	1-7[a]
PBC[*]	16G. I have complete control over using proper handwashing techniques.	1-7[a]
PBC[*]	24E. It is mostly up to me whether I use a thermometer to check the temperature of food.	1-7[a]
PBC[*]	24G. I have complete control over using a thermometer to check the temperature of food.	1-7[a]

Indirect Measures
Behavioral Beliefs (bb$_i$)
| BB[*] | 1. Proper cleaning and sanitizing of food contact will _____. | 1-7[a] |

BB[*] — 1. Proper cleaning and sanitizing of food contact will _____.   1-7[a]

BB[*] — 9. Proper handwashing techniques will _____.   1-7[a]

BB[*] — 17. Using a thermometer to check the temperature of food will _____.   1-7[a]

Outcome Evaluation (be$_i$)

BB[*] — 2. How important is each of the following items to you for using proper cleaning and sanitizing of food contact surfaces?   1-7[c]

BB[*] — 10. How important is each of the following items to you in relation to using proper handwashing techniques?   1-7[c]

BB[*] — 18. How important is each of the following items to you for using a thermometer to check the temperature of food?   1-7[c]

Normative Beliefs (nb$_i$)

NB[*] — 3. _____ think(s) that I should use proper cleaning and sanitizing of food contact surfaces.   1-7[a]

NB[*] — 11. _____ think(s) that I should use proper handwashing techniques.   1-7[a]

NB[*] — 19. _____ think(s) that I should use a thermometer to check the temperature of food.   1-7[a]

Motivation to Comply (mc$_i$)

NB[*] — 4. Generally speaking, how much do you care what _____ think(s) you should do in regards to properly cleaning and sanitizing food contact surfaces?   1-7[d]

NB[*] — 12. Generally speaking, how much do you care what _____ think(s) you should do?   1-7[d]

NB[*] — 20. Generally speaking, how much do you care what _____ think(s) you should do?   1-7[d]

Control Beliefs (cb$_i$)

CB[*] — 5. _____ makes it difficult for me to properly clean and sanitize food contact surfaces.   1-7[a]

CB[*] — 13. _____ makes it difficult for me to use proper handwashing techniques.   1-7[a]

CB[*] — 21. _____ makes it difficult for me to use a thermometer to check the temperature of food.   1-7[a]

Power of Control Belief (pp$_i$)

CB[*] — 6. How often does _____affect you from properly cleaning and sanitizing food contact surfaces?   1-7[e]

CB[*] — 14. How often does _____prevent(s) you from using proper handwashing techniques?   1-7[e]

CB[*] — 22. How often does _____prevent(s) you from using a thermometer to check the temperature of food?   1-7[e]

---

[*] BI- Behavioral Intention, ATT- Attitude, SN- Subjective Norm, PBC- Perceived Behavioral Control, BB- Behavioral Beliefs, NB- Normative Beliefs, CB- Control Beliefs

[a] Strongly Disagree (1) to Strongly Agree (7)

[b] Extremely Bad, Extremely Worthless, Extremely Useless, Extremely Unpleasant, and Extremely Foolish (1) to Extremely Good, Extremely Valuable, Extremely Useful, Extremely Pleasant, and Extremely Wise (7)

[c] Extremely Unimportant (1) to Extremely Important (7)

[d] Not at All (1) to Very Much (7)

[e] Very Rarely (1) to Very Frequently (7)

Appendix C:

Primary Study Recruitment Postcard

Your Opinions Count and We Want to Hear Them

Please help us make food served in schools the safest it can be!

Who: School Nutrition Employees

What: Questionnaire about their attitudes and knowledge regarding safe food practices and behaviors in school nutrition programs

Why: To increase food safety practices and make our schools safer

Next Steps: During this week you will receive a FedEx box with a set of questionnaires for your employees to complete.

If you would like more information call us at (785) 532-5549 or follow this link:

https://qtrial2014az1.az1.qualtrics.com/SE/?SID=SV_4308XFXef7VIbgV

If you want to know more about us visit: http://cnsafefood.k-state.edu/

The Center of Excellence for
FOOD SAFETY RESEARCH IN
CHILD NUTRITION PROGRAMS

Appendix D:

Primary Study Introduction Letter

Dear School Nutrition Director,

Foodborne illnesses continue to account for a large number of illnesses, hospitalizations, and deaths each year in the United States. Given that over 2.2 billion meals and snacks are served each year through the National School Lunch Program (NSLP), School Breakfast Program, Summer Food Service, After School Snack Programs, and the Child and Adult Care Feeding Programs the opportunity exists for large-scale foodborne outbreaks to occur with serious complications within the school environment. Employee knowledge and attitudes are important factors that protect schools and children from foodborne illness outbreaks.

The goals of this project are to implement a training program to overcome employee barriers to food safety implementation and to encourage the use of food safety practices in school foodservice operations. The end results will be an increase in the food safety practices utilized in child nutrition operations and a decrease in the incidences of foodborne illnesses.

Participation of school nutrition program employees is very important to the success of this stage of the study and to the quality of future food safety education. Their participation is completely voluntary and they may discontinue at any time without penalty. Individual responses will not be identifiable and all results will be reported as group data.

You will find the questionnaires in this box please distribute them to the employees willing to participate. It will take them about 20 minutes to complete all of the questions. Employees do not need to complete the questionnaire during regular working hours. After they have finished, collect sealed questionnaires, place five (5) questionnaires in each prepaid return envelope and mail them back.

We know school is almost over, we appreciate if you could help us by distributing and collecting the questionnaires before school goes out for summer! Should you have any questions, please contact Paola Paez at (785) 532-5549 or by email, paolap@ksu.edu.

Cordially,
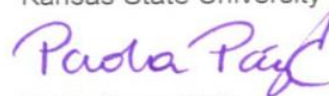
Kevin Roberts, PhD
Director
Center of Excellence for Food Safety
Research in Child Nutrition Programs
Kansas State University

Kevin Sauer, PhD, RDN, LD
Associate Professor
Center of Excellence for Food Saf
Research in Child Nutrition Progra
Kansas State University

Carol Shanklin, PhD, RD
Professor and Dean of the Graduate School
Center of Excellence for Food Safety
Research in Child Nutrition Programs
Kansas State University

Paola Paez, PhD
Research Associate Professor
Center of Excellence for Food Saf
Research in Child Nutrition Progra
Kansas State University

Appendix E:

Median Values for Proper Cleaning and Sanitizing Food Contact Surfaces

Table E1. Median Values of Direct Measures for Proper Cleaning and Sanitizing of Food Contact Surfaces (N=408)

Measure (Scale)	Median	SD	Reliability
Attitude[a] (Median Composite Score = 7.0 ± 0.47)			0.81
Extremely Bad (1) – Extremely Good (7)	7.0	0.40	
Extremely Worthless (1) – Extremely Valuable (7)	7.0	0.40	
Extremely Useless (1) – Extremely Useful (7)	7.0	0.58	
Extremely Foolish (1) – Extremely Wise (7)	7.0	0.57	
Extremely Unpleasant (1) – Extremely Pleasant (7)	7.0	0.98	
Subjective Norms[b] (Median Composite Score = 7.0 ± 0.40)			0.73
It is expected that I will properly clean and sanitize food contact surfaces.	7.0	0.31	
The people in my life whose opinions I value would want me to properly clean and sanitize food contact surfaces.	7.0	0.50	
Most people who are important to me think that I should properly clean and sanitize food contact surfaces.	7.0	0.62	
Perceived Behavioral Control[b] (Median Composite Score = 7.0 ± 1.07)			0.72
I have complete control over properly cleaning and sanitizing food contact surfaces.	7.0	0.98	
It is mostly up to me whether I properly clean and sanitize food contact surfaces.	7.0	1.40	
Behavioral Intention[b] (Median Composite Score = 7.0 ± 0.31)			0.84
I plan to properly clean and sanitize food contact surfaces.	7.0	0.30	
I will try to properly clean and sanitize food contact surfaces.	7.0	0.41	
I intend to properly clean and sanitize food contact surfaces.	7.0	0.34	

[a] The stem asked respondents, "For me to properly clean and sanitize food contact surfaces is _____".
[b] Scale value ranges from *Strongly Disagree (1)* to *Strongly Agree (7).*

Table E2. Median Values of Belief Items for Properly Cleaning and Sanitizing Food Contact Surfaces (N=408)

Belief Items	Strength Median[a]	Evaluation Median[b]	Overall Beliefs Median[c]
Behavioral Beliefs *($\sum bb_i be_i$ = 57.0 ± 16.4)*	bb_i*	be_i*	$bb_i be_i$*
Decrease the likelihood that students will get sick	7.0	3.0	21.0
Keep my students satisfied	6.0	3.0	18.0
Ensure high food quality	7.0	3.0	21.0
Take too much time	1.0	1.0	1.0
Normative Beliefs *($\sum nb_i mc_i$ = 182.0 ± 30.7)*	nb_i*	mc_i*	$nb_i mc_i$*
Health inspector	7.0	3.0	21.0
Immediate supervisor	7.0	3.0	21.0
School nutrition director	7.0	3.0	21.0
School Nurse	7.0	3.0	21.0
School administrators	7.0	3.0	21.0
Other employees	7.0	3.0	21.0
Parents	7.0	3.0	21.0
Teachers	7.0	3.0	21.0
My students	7.0	3.0	18.0
Control Beliefs *($\sum cb_i pp_i$ = -15.0 ± 33.9)*	cb_i*	pp_i*	$cb_i pp_i$*
Time	2.0	-3.0	-3.0
Lack of supplies	2.0	-3.0	-3.0
Access to equipment	2.0	-3.0	-3.0
Lack of equipment	2.0	-3.0	-3.0
Funds	2.0	-3.0	-3.0

[a] Strength medians were measured on a 1 to 7 scale.

[a] Evaluation medians were measured on a -3 to 3 scale.

[c] Overall belief median represents the median of the strength of each individual item multiplied by the evaluation of that item. Possible score range from -21 to 21.

* Note: bb = Behavioral Beliefs, be = Behavioral Beliefs Evaluation, nb = Normative Beliefs, mc = Motivation to Comply, cb = Control Beliefs, pp = Perceived Power

Appendix F:

Median Values for Proper Handwashing

Table F1. Median Values of Direct Measures for Proper Handwashing (N=408)			
Measure (Scale)	**Median**	**SD**	**Reliability**
Attitude[a] (Median Composite Score = 7.0 ± 0.40)			0.82
Extremely Bad (1) – Extremely Good (7)	7.0	0.36	
Extremely Worthless (1) – Extremely Valuable (7)	7.0	0.39	
Extremely Useless (1) – Extremely Useful (7)	7.0	0.48	
Extremely Foolish (1) – Extremely Wise (7)	7.0	0.49	
Extremely Unpleasant (1) – Extremely Pleasant (7)	7.0	0.83	
Subjective Norms[b] (Median Composite Score = 7.0 ± 0.37)			0.80
It is expected that I will use proper handwashing techniques.	7.0	0.28	
The people in my life whose opinions I value would want me to use proper handwashing techniques.	7.0	0.46	
Most people who are important to me think that I should use proper handwashing techniques.	7.0	0.53	
Perceived Behavioral Control[b] (Median Composite Score = 7.0 ± 0.86)			0.82
I have complete control over using proper handwashing techniques.	7.0	0.82	
It is mostly up to me whether I use proper handwashing techniques.	7.0	1.04	
Behavioral Intention[b] (Median Composite Score = 7.0 ± 0.31)			0.75
I plan to use proper handwashing techniques.	7.0	0.30	
I will try to use proper handwashing techniques.	7.0	0.41	
I intend to use proper handwashing techniques.	7.0	0.41	

[a] The stem asked respondents, "For me to use proper handwashing techniques is _____".
[b] Scale value ranges from *Strongly Disagree (1) to Strongly Agree (7).*

Table F2. Median Values of Belief Items for Proper Handwashing (N=408)

Belief Items	Strength Median[a]	Evaluation Median[b]	Overall Beliefs Median[c]
Behavioral Beliefs ($\sum bb_i be_i = 60.0 \pm 14.0$)	bb_i*	be_i*	$bb_i be_i$*
Decrease the likelihood that students will get sick	7.0	3.0	21.0
Ensure high food quality	7.0	3.0	21.0
Keep my students satisfied	7.0	3.0	21.0
Take too much time	1.0	0.0	0.0
Normative Beliefs ($\sum nb_i mc_i = 189.0 \pm 28.1$)	nb_i*	mc_i*	$nb_i mc_i$*
Health inspector	7.0	3.0	21.0
Immediate supervisor	7.0	3.0	21.0
School nutrition director	7.0	3.0	21.0
Parents	7.0	3.0	21.0
School Nurse	7.0	3.0	21.0
School administrators	7.0	3.0	21.0
Other employees	7.0	3.0	21.0
Teachers	7.0	3.0	21.0
My students	7.0	3.0	21.0
Control Beliefs ($\sum cb_i pp_i = -16.0 \pm 30.2$)	cb_i*	pp_i*	$cb_i pp_i$*
Time	2.0	-3.0	-3.0
Lack of supplies	1.0	-3.0	-3.0
Access to equipment	1.0	-3.0	-3.0
Lack of equipment	1.0	-3.0	-3.0
Funds	1.0	-3.0	-3.0

[a] Strength medians were measured on a 1 to 7 scale.
[a] Evaluation medians were measured on a -3 to 3 scale.
[c] Overall belief median represents the mean of the strength of each individual item multiplied by the evaluation of that item. Possible score range from -21 to 21.
*Note: *bb* = Behavioral Beliefs, *be* = Behavioral Beliefs Evaluation, *nb* = Normative Beliefs, *mc* = Motivation to Comply, *cb* = Control Beliefs, *pp* = Perceived Power

Appendix G:

Median Values for Using a Thermometer to Check the Temperature of Food

Table G1. Median Values of Direct Measures for Using a Thermometer to Check the Temperature of Food (N=408)			
Measure (Scale)	**Median**	**SD**	**Reliability**
Attitude [a] (Median = 7.0 ± 0.37)			0.77
Extremely Bad (1) – Extremely Good (7)	7.0	0.53	
Extremely Worthless (1) – Extremely Valuable (7)	7.0	0.34	
Extremely Useless (1) – Extremely Useful (7)	7.0	0.36	
Extremely Foolish (1) – Extremely Wise (7)	7.0	0.39	
Extremely Unpleasant (1) – Extremely Pleasant (7)	7.0	0.81	
Subjective Norms [b] (Median = 7.0 ± 0.45)			0.78
It is expected that I will use a thermometer to check the temperature of food.	7.0	0.38	
The people in my life whose opinions I value would want me to use a thermometer to check the temperature of food.	7.0	0.62	
Most people who are important to me think that I should use a thermometer to check the temperature of food.	7.0	0.59	
Perceived Behavioral Control [b] (Median = 7.0 ± 1.06)			0.75
I have complete control over using a thermometer to check the temperature of food.	7.0	1.03	
It is mostly up to me whether I use a thermometer to check the temperature of food.	7.0	1.31	
Behavioral Intention [b] (Median = 7.0 ± 0.37)			0.67
I plan to use a thermometer to check the temperature of food.	7.0	0.36	
I intend to use a thermometer to check the temperature of food.	7.0	0.34	
I will try to use a thermometer to check the temperature of food.	7.0	0.65	

[a] The stem asked respondents, "For me to use a thermometer to check the temperature of food is _____".
[b] Scale value ranges from *Strongly Disagree (1) to Strongly Agree (7).*

Table G2. Median Values of Belief Items for Using a Thermometer to Check the Temperature of Food (N=408)

Belief Items	Strength Median[a]	Evaluation Median[b]	Overall Beliefs Median[c]
Behavioral Beliefs *($\sum bb_i be_i = 60.0 \pm 13.4$)*	bb_i*	be_i*	$bb_i be_i$*
Decrease the likelihood that students will get sick	7.0	3.0	21.0
Ensure high food quality	7.0	3.0	21.0
Keep my students satisfied	7.0	3.0	21.0
Take too much time	1.0	0.0	0.0
Normative Beliefs *($\sum nb_i mc_i = 189.0 \pm 33.9$)*	nb_i*	mc_i*	$nb_i mc_i$*
Health inspector	7.0	3.0	21.0
Immediate supervisor	7.0	3.0	21.0
School nutrition director	7.0	3.0	21.0
Other employees	7.0	3.0	21.0
School Nurse	7.0	3.0	21.0
School administrators	7.0	3.0	21.0
Parents	7.0	3.0	21.0
Teachers	7.0	3.0	21.0
My students	7.0	3.0	21.0
Control Beliefs *($\sum cb_i pp_i = -15.0 \pm 32.1$)*	cb_i*	pp_i*	$cb_i pp_i$*
Time	2.0	-3.0	-3.0
Lack of supplies	1.0	-3.0	-3.0
Access to equipment	1.0	-3.0	-3.0
Lack of equipment	1.0	-3.0	-3.0
Funds	1.0	-3.0	-3.0

[a] Strength medians were measured on a 1 to 7 scale.

[a] Evaluation medians were measured on a -3 to 3 scale.

[c] Overall belief median represents the mean of the strength of each individual item multiplied by the evaluation of that item. Possible score range from -21 to 21.

*Note: *bb* = Behavioral Beliefs, *be* = Behavioral Beliefs Evaluation, *nb* = Normative Beliefs, *mc* = Motivation to Comply, *cb* = Control Beliefs, *pp* = Perceived Power