Analysis of Health Inspection Reports for School Nutrition Operations in the U.S.: Summary Report



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Analysis of Health Inspection Reports for School Foodservice Operations in the U.S.: Summary Report

Page | i

Table of Content

Table of Contentsii
List of Tablesiii
List of Figures iv
Executive Summaryv
Acknowledgementsviii
Background 1
Objectives
Materials and Methods
Sample Selection
Variables and Data Collection
Data Consolidation and Analyses
Results and Discussion
Frequently Cited Food Code Violation Categories14
Frequently Cited Behavioral and Non-behavioral Food Code Violations
Variations among States
Conclusions
Recommendations
References
APPENDIX A: Food Code Violation Categories Missing in State Inspection Reports
APPENDIX B: Mean Number of Food Code Violations in 31 Categories by State

List of Tables

Table 1. Summary of State Inspection Reports	. 7
Table 2. Examples of Food Code Violations in 30 Categories	9
Table 3. Number of Different Types of Violations in 31 Categories (N = 28,171)	12
Table 4. Number of Food Code Violations per School (N=28,171)	14
Table 5. Top Five Food Code Violation Categories Ranked by States $(n = 21)$	17

List of Figures

Figure 1. Sampled States	5
Figure 2. Percentage of <i>Premise and Equipment Maintenance</i> Violations in 21 States	20
Figure 3. Percentage of <i>Protecting Food from Contamination</i> Violations in 21 States	21
Figure 4. Percentage of <i>Pest and Animal Control</i> Violations in 21 States	22
Figure 5. Percentage of Use of Utensils and Linens Violations in 21 States	23
Figure 6. Percentage of Non-food Contact Surface Maintenance Violations in 21 States	24
Figure 7. Percentage of <i>Plumbing and Adequate Toilet Facilities</i> Violations in 21 States	25
Figure 8. Percentage of <i>Time and Temperature Control</i> Violations in 21 States	26
Figure 9. Percentage of Food Contact Surface Maintenance Violations in 21 States	27

Executive Summary

The Child Nutrition and WIC Reauthorization Act of 2004 requires that schools be inspected twice annually. There has been no research on how health inspections impact food safety in schools or how inspection data can be used to improve food safety. Thus, this study focuses on identifying food safety risks in school nutrition operations based on inspection data and establishing baseline information about food safety risks and practices. Health inspection reports from all school foodservice facilities in 21 states across the U.S. (n = 28, 171) were studied. All food code violations from health inspection reports recorded on the original state inspection form were categorized into behavioral, non-behavioral, critical, and non-critical violations and consolidated into 31 food code categories. Behavioral violations were identified when the food code specifically referred to a practice conducted by a food handler. Nonbehavioral violations were identified when the food code refers to the condition of facilities, policies and procedures, or preventative programs like pest control that are not under the direct control of food handlers. Critical violations are those violations, which if not corrected, are likely to contribute to food contamination and illness. These might include improper cooling, holding, or reheating. Critical violations are determined within each jurisdiction. Non-critical violations would include any violation not classified as critical.

Overall, the most frequently cited food code violations in schools related to *Premise and Equipment Maintenance* (18.5%) followed by *Protecting Food from Contamination* (6.3%), *Pest and Animal Control* (6.1%), *Use of Utensils and Linens* (5.9%), and *Non-food Contact Surface Maintenance* (5.6%). The most widespread violation categories were *Premise and Equipment Maintenance* (ranked as one of the top five challenges in 18 states) followed by *Protecting Food*

from Contamination (13 states), Non-food Contact Surface Maintenance (11 states), Time and Temperature Control (9 states), and Ware Washing (9 states).

Conclusions

Based on this study, we reached the following conclusions:

- Food code violations related to *Premises and Equipment Maintenance* are not only the highest in the number of violations, but also the most widespread among the school nutrition operations across the states. For 18 of 21 states included in this study, premises and equipment maintenance was one of the top five violation categories.
- 2. Most food code violations in school nutrition operations involve facilities and equipment.
- 3. *Protecting Food from Contamination* and Use of Utensils and Linens were two categories with the most behavioral violations other than the *Premises and Equipment Maintenance* category.
- 4. We found large variations in information available on health inspection reports and unique challenges among different states. Health inspection reports from several states did not include high-risk related food code violations identified by epidemiological data.

Recommendations

We recommend the following:

 Although food safety risks associated with food code violations in school nutrition operations are minimal, the most frequently occurring violations are related to the facility and/or equipment maintenance. Therefore, these data may be useful to child nutrition professionals to convince school administrators to provide financial support to improve facilities and equipment. It may also show Federal decision makers that there is a need for funding to support these areas.

- 2. Use the major behavioral challenges identified in this report for developing educational programs for employee supervision and training. For example, behaviors related to issues such as cross-contamination and time and temperature control should be addressed.
- Future research may focus on identifying state-specific food safety challenges identified in this research (e.g., *Pest and Animal Controls* in New York and *Approved Food Sources* in Rhode Island) and assessing trends and changes in health inspection reports.

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Background

The Centers for Disease Control and Prevention (CDC) reported 1,034 foodborne illness outbreaks in 2008, resulting in 23,152 illnesses, 1,276 hospitalizations, and 22 deaths (CDC, 2011). The highest number of foodborne illness outbreaks are traced to food served in restaurants or delis (52%) (CDC, 2011), with private residence ranked second and school nutrition operations third (Lynch et al., 2006). Although foodborne illness outbreaks attributed to school nutrition operations are less frequent (n = 285) than those from restaurants (n = 3,334) (Lynch et al., 2006), the average number of illnesses caused per outbreak is over three times higher in schools (mean = 47.2) than restaurants or delis (mean = 14.2) (http://wwwn.cdc.gov/foodborneoutbreaks/Default.aspx).

More than 31 million students eat meals daily in more than 100,000 school cafeterias (USDA, FNS, 2012), and foodborne illness outbreaks stemming from school nutrition operations occur infrequently. One possible reason may be the food safety programs required for school nutrition operations. The Child Nutrition and WIC Reauthorization Act of 2004 mandated that school nutrition operations establish food safety programs based on Hazard Analysis Critical Control Point (HACCP) principles. Further, the Act required that all schools have two health inspections annually.

The importance of minimizing the risk of foodborne illness outbreaks in school nutrition operations by ensuring food safety cannot be overemphasized. Because foodborne disease is preventable and common (Jones & Angulo, 2006), it is crucial to maintain safety of food throughout distribution, production, to service. To be successful, a combination of training, regulation, and inspection is required (Papadopoulos et al., 2012). Training, in combination with certification, of managers and food workers, is important to ensure that safe food handling procedures are consistently followed (Jones & Angulo, 2006).

Because most foodborne illness outbreaks in the U.S. involve improper food handling (Lynch et al., 2006), school nutrition professionals must the recognize relative risks associated with common mishandling of food and improve food handling through continuous training and employee motivation. The first step to ensure safe food handling is to identify the status of food handling practices in school nutrition programs.

Frequent food safety inspections are a fundamental component of public health efforts to prevent foodborne illness (Realmuto, Hunting, & Parkin, 2013). Examination of health inspection reports can help researchers identify behavioral challenges in a wide variety of foodservice operations. For example, inspections have been utilized in research with commercial restaurants, where inspection records show independently owned restaurants are cited for more critical violations than chain restaurants (Harris, DiPietro, Murphy, & Rivera, 2014; Phillips, Elledge, Basara, Lynch, & Boatright, 2006). Additionally, researchers using health inspection data from Kansas identified food safety challenges and training needs in independently owned ethnic restaurants. Based on inspection results, Asian and Latin American restaurants reflected the need for increased training in the "safe cooling, thawing hot holding methods and working" thermometers" inspection category. Latin American restaurants also showed a need for training in the "demonstration of knowledge" inspection category (Kwon, Roberts, Shanklin, Liu, & Yen, 2010). Kwon et al. (2010) also observed that follow up inspections, which are triggered by poor performance on routine inspections, usually resulted in significantly fewer food code violations than the proceeding inspection reports. Further, research comparing inspection results from independent ethnic restaurants, chain ethnic restaurants, independent non-ethnic restaurants, and

Analysis of Health Inspection Reports for School Foodservice Operations in the U.S.: Summary Report

P a g e | 2

chain non-ethnic restaurants confirmed that independent ethnic restaurants were inspected more and cited with more critical and non-critical violations than any of the other restaurant categories studied (Roberts, Kwon, Shanklin, Liu, & Yen, 2011).

Kwon, Choi, Liu, and Lee (2012) explored the health inspection reports of Asian restaurants in a Midwestern state. The results of their study found Time & Temperature Control of PHF (TCS); Prevention from Contamination; Control Hands as a Vehicle of Contamination; Physical Facility Maintenance; and Food & Non-Food Contact Surface Maintenance & Ware Washing Facilities were the categories with the highest number of violations.

The type and quality of information available from health inspection reports, however, varies depending on the forms used by each jurisdiction, which becomes an issue when comparing data across several locations. This may explain why some studies using inspection reports were limited to one state or region with uniform inspection processes and forms.

Although health inspection reports may provide only limited insight into food handling behaviors and other food safety conditions, they can provide data to identify trends and unique challenges across a large number of similar operations. A systematic assessment of food code violations prevalent in school nutrition operations across the U.S. and in specific states can guide interventions and future research and serve as baseline data for evaluating the long-term effectiveness of food safety interventions and training programs.

Therefore, the purpose of this research was to identify food safety risks and operational and behavioral changes needed in school nutrition operations and develop a baseline for assessing progress in reducing food safety risks.

Objectives

The objectives of this research were to:

- 1. Identify the most prevalent food safety risks in school nutrition operations,
- 2. Identify specific employee behavior-related risks,
- 3. Identify opportunities for improving health inspection scores in school nutrition operations,
- 4. Determine training needs based on risks and identify research needs.

Materials and Methods

Sample Selection

The sample for this study included all schools (n = 28,171) participating in the National School Lunch Program in 21 randomly selected states in the U.S. (Figure 1). Three states were selected from each of the seven USDA regions. The Center of Excellence for Food Safety Research in Child Nutrition Programs (Center) staff contacted the state agencies or counties responsible for overseeing health inspections in each selected state to obtain the most recent routine health inspection reports. Inspection reports were either obtained through an online reporting system or as hard copies mailed, emailed, or faxed to the Center. No institutional review board approval was necessary because secondary data from public records were used for data collection.

Variables and Data Collection

The number of items observed during inspections in each state varied greatly from 34 items (Hawaii) to 415 items (Virginia) and were based on the jurisdictional food code. Each violation noted on the inspection form was recorded on a data collection





form using a Microsoft Access database. Data for each state were entered into separate databases. The original verbiage from all state inspection reports was maintained so that researchers could refer to them when categorizing and analyzing data.

After entering individual violations for all 21 states, each violation was identified as a behavioral or non-behavioral violation and critical or non-critical violation. Behavioral violations were identified when the food code specifically referred to a practice performed by a food handler. For example, food code violations such as *frequency of cleaning nonfood-contact surfaces, manual/mechanical ware washing and sanitizing at proper temperature and*

Page | 5

concentration of the chemical, and *good hygienic practices including proper eating, tasting, drinking, or tobacco use* were coded as behavioral violations. Non-behavioral violations were identified when the food code refers to the condition of facilities, policies and procedures, or preventative programs like pest control that are not under the direct control of food handlers. For example, *accuracy of temperature measuring devices for food, plumbing properly installed and maintained,* and *adequate ventilation and lighting* were coded as non-behavioral violations.

In some instances, the verbiage of inspection items implied both behavioral and nonbehavioral components. Because researchers had no knowledge of the actual situation at the time of inspection, these violations were classified as both. For example, one food code violation stated, *Handwashing facilities adequate/Accessible with soap and towels*, which may be behavioral or non-behavioral. Even though employees have no control over the adequacy of handwashing facilities (non-behavioral), they can assure that soap and paper towels are available for use (behavioral). Because researchers could not distinguish which was the case from the health inspection report, this violation was coded as both behavioral and non-behavioral. This decision meant the total food code violations was less than the sum of behavioral and nonbehavioral violations in some states because some code violations were counted twice.

Table 1 summarizes results of the state inspection reports including the number of schools from each state included in the sample, number of inspection items from each state's inspection form, and the range of dates of the health inspection reports. More specific information on missing food code violation categories from each state is provided in Appendix A.

Table 1. Summary of State Inspection Reports								
States	Number of Schools	Number of Food Code Criteria included in Reports	Number of Categories (Max = 30)	Inspection Date From	Inspection Date To			
Alaska	270	55	30	4/7/2008	11/9/2011			
Alabama	1316	42	27	9/7/2010	11/1/2011			
Colorado	1129	195	27	1/4/2010	11/7/2011			
Florida	3210	44	24	1/31/2010	11/8/2011			
Hawaii	274	34	20	1/26/2009	11/3/2011			
Idaho	481	122	30	9/29/2009	5/24/2011			
Kentucky	1184	38	26	1/22/2010	11/15/2011			
Louisiana	1459	168	29	4/1/2008	9/29/2011			
Maryland	1018	37	28	4/7/2009	1/12/2012			
Michigan	3168	330	30	1/8/2009	12/22/2011			
Missouri	1689	352	30	9/29/2009	3/15/2012			
North Dakota	369	216	30	8/24/2010	12/8/2011			
New Hampshire	455	44	24	12/7/2009	12/17/2011			
New Mexico	492	211	30	2/19/2009	11/30/2011			
New York	2890	66	28	2/16/2010	11/15/2011			
Ohio	2858	43	19	2/4/2009	12/15/2011			
Oklahoma	1227	52	29	8/20/2009	12/7/2011			
Pennsylvania	1011	208	30	1/4/2010	11/21/2011			
Rhode Island	273	55	29	1/6/2010	12/21/2011			
Virginia	1793	415	30	1/31/2010	1/12/2012			
Wisconsin	1605	55	29	11/5/2009	12/2/2011			
TOTAL	28,171							

Each state's inspection reports identified critical violations. Researchers found no consistency in critical violations across the 21 states. Therefore, only those violations that were annotated as "critical" in the original health inspection forms were identified as critical violations

in our data set. In three states (Hawaii, Louisiana, and Ohio), critical and non-critical violations could not be distinguished, so no further annotations were included (Appendix A). The sum of critical and non-critical violations for the sample was not the same as the total violations because data from these three states (Hawaii, Louisiana, and Ohio) were excluded from the calculations.

Data Consolidation and Analyses

In addition to identifying behavioral or critical violations, we assigned each inspection item to one of 30 predetermined food code categories. These categories were derived from previous research (Kwon et al., 2010; Roberts et al., 2011), modified, and included a variety of food handling procedures and operational conditions. When a code violation did not fit into one of these 30 categories, the item was coded as "Other". See Table 2 for examples of food code violations in each of the 30 categories.

Once each inspection item was assigned to a category and identified as a behavioral, nonbehavioral, critical, or non-critical violation, each state's data were transformed into the final data file using the following equation:

$N_{cat#, Beh} = N_{code1} \times Beh_{(0 \text{ or } 1)} + N_{code2} \times Beh_{(0 \text{ or } 1)} + N_{code3} \times Beh_{(0 \text{ or } 1)} + \dots$

Where $N_{cat#, Beh}$ is the number of behavioral code violations in category #; $N_{code#}$ is the number of code violations within the category #; and $Beh_{(0 \text{ or } 1)}$ is the behavioral violation factor when 0 is assigned for non-behavioral code violations and 1 for behavioral code violations. Numbers of critical and non-critical violations within each category were calculated using a similar equation:

 $N_{cat#, Crit} = N_{code1} \times Crit(0 \text{ or } 1) + N_{code2} \times Crit(0 \text{ or } 1) + N_{code3} \times Crit(0 \text{ or } 1) + \dots$

Violation Categories	Inspection Items					
Person in Change	Designation of person in charge					
	Duties of the person in charge					
Employee Health	Proper use of reporting, restriction, exclusion					
	Personnel with infections restricted/excluded					
Handwashing & Handwash	Cleanliness of hands and exposed portions of arms					
Sinks	Adequate/inadequate handwashing facilities					
Personal Cleanliness &	Hair restraints					
Grooming	Jewelry-fingernails					
Approved Food Sources	Food obtained from approved source					
	Discarding or reconditioning unsafe, adulterated, or contaminated food					
Protecting Food from	Food protected during storage, display, transportation, service					
Contamination	Food received at proper temperature					
Cooling	Proper cooling for cooked/prepared food (135°-70°F in 2 hrs./ 70° - 41° F in 4 hrs.)					
	Potentially hazardous food (PHF): cooling					
Reheating	Rapid reheating (165°F in 2 hrs.)					
	Proper reheating procedures for hot holding					
Cooking	Proper cooking temperature for PHF/ time and temperature control for safety (TCS) foods					
	Cooking raw animal-derived foods					
Thawing	Approved thawing methods used					
	Potentially hazardous food: thawing					
Time & Temperature Control	Potentially hazardous food (PHF): hot and cold holding					
	Cold hold (41°F)/Time control					
Adequate Equipment for	Equipment adequate to maintain product temperature					
Cold/Hot Holding	Cooling, heating, and holding capacities					
Date-marking & Labeling	Receiving shucked shellfish: packaging and identification					
	Food properly labeled; original container					
Use of Thermometers & Test	Accuracy of temperature measuring devices for food					
Kits	Accurate thermometers, chemical test kits provided					
Use of Single-use Gloves &	Single-use & single-service articles: Properly stored & used					
Utensils/Bare Hand Contact	Handling of dishware					
Use of Utensils & Linens	In-use food or ice dispensing utensils properly stored and used					
	Utensils, equipment & linens: properly stored, dried, & handled					
Wiping Clothes	Wiping cloths clean, use restricted, rinsed/stored in proper clean					
	Wiping cloths: air-drying locations					

Table 2. Examples of Food Code Violations in 30 Categories

Violation Categories	Inspection Items				
Food Contact Surfaces	Food contact surfaces of equipment and utensils cleaned/sanitized/ good repair				
	Lubricating and reassembling clean food-contact surfaces and equipment				
Non-food Contact Surfaces	Frequency of cleaning nonfood-contact surfaces				
	Non-food contact surfaces properly designed, constructed, maintained, installed, located, NSF approved				
Ware Washing	Equipment and utensils pre-flushed (rinsed), scraped, soaked				
	Washing: loading of soiled items into ware washing machines				
Water & Ice Supply	Hot & cold water available; adequate pressure				
	Ice for use as a food or a cooling medium shall be made from drinking water				
Waste Water & Sewage	Sewage & waste water properly disposed				
	Approved water supply/Sewage Disposal Systems/Cross-Connections				
Plumbing & Adequate Toilet	Ice units: separation of drains				
Facilities	Plumbing installed; proper backflow devices				
Toilets	Toilet facilities; properly constructed, supplied, & cleaned				
	Toilet rooms: located for convenience				
Premises & Equipment Maintenance	Location of equipment, clothes washers and dryers, and storage cabinets to prevent contamination				
	Floors, walls, ceilings in good repair, clean, constructed properly				
Lighting & Ventilation	Lighting provided as required, fixtures shielded properly				
	Adequate ventilation & lighting; designated areas used				
Garbage & Recycling Facilities Outside	Outside storage area/enclosures properly constructed, clean, located on proper surface, drained				
	Garbage & refuse properly disposed; facilities maintained				

Table 2. Examples of Food Code Violations in 30 Categories

Where N_{cat#, Crit} is the number of critical violations in category #; and Crit_(0 or 1)

is the critical violation factor when 0 is assigned for non-critical code violations and 1 for critical violations.

The consolidated file, with information from 28,171 health inspection reports, was then converted to SPSS format for analysis. Descriptive statistics included frequencies, means, and

standard deviations for behavioral, non-behavioral, critical, and non-critical violations and were calculated for each food code violation category for the overall sample (n = 28,171) and by state. The number of violations in each category and for the overall sample was calculated with percentages of violations in each category based on the total number of violations to identify the greatest food safety challenges. If a certain state's inspection form did not include one or more food code violation categories, they were treated as "missing data" rather than being counted as no violation.

Because the number of schools included in each state varied from 270 schools in Alaska to 3,210 in Florida, the data were skewed as a result of the number of violations prevalent in states with more schools (see Table 3). To address this imbalance, we calculated percentages of violations in each category based on total violations and ranked violation categories from the most prevalent to the fifth most prevalent. The food code violation category with the highest percentage of total violations was assigned a score 5.0 (ranking of 1) followed by a ranking of 2 for a score of 4.0, a ranking of 3 for a score of 3.0, a ranking of 4 for a score of 2.0, and a ranking of 5 for a score of 1.0. All others categories were assigned a score of 0.

Descriptive statistics such as frequencies, mean scores, and standard deviations for the number of total, behavioral versus non-behavioral, and critical versus non-critical violations by category was used to identify the most frequent food safety challenges. Descriptive statistics of ranked values enabled researchers to identify widespread challenges across all 21 states without violation citations in a small number of large states influencing the conclusions.

Table 3. Number of Different Types of Violations in 31 Categories ($N = 28,171$)								
		No. of Violations in	Mean number of violations per each facility ± Standard Dev					
		Each Category	Behavioral	Non-behavioral	Critical	Non-critical		
Violation Categories	n ^a	(%) ^b	Violations	Violations	Violations	Violations		
Premises & Equipment Maintenance	28,171	9,797 (18.5)	0.19 ± 0.53	0.21 ± 0.56	0.08 ± 0.34	0.26 ± 0.61		
Protecting Food from Contamination	28,171	3,355 (6.3)	0.12 ± 0.37	0.00 ± 0.02	0.03 ± 0.22	0.09 ± 0.29		
Pest & Animal Controls	25,313	3,247 (6.1)	0.07 ± 0.44	0.07 ± 0.42	0.01 ± 0.11	0.12 ± 0.61		
Use of Utensils & Linens	28,171	3,133 (5.9)	0.11 ± 0.44	0.00 ± 0.02	0.00 ± 0.04	0.11 ± 0.46		
Non-food Contact Surface Maintenance	23,943	2,988 (5.6)	0.08 ± 0.30	0.06 ± 0.24	0.01 ± 0.12	0.14 ± 0.40		
Plumbing & Adequate Toilet Facilities	28,171	2,605 (4.9)	0.02 ± 0.19	0.07 ± 0.28	0.02 ± 0.15	0.07 ± 0.28		
Time & Temperature Control	28,171	2,366 (4.5)	0.08 ± 0.30	0.00 ± 0.00	0.09 ± 0.31	0.00 ± 0.04		
Food Contact Surface Maintenance	24,961	2,317 (4.4)	0.07 ± 0.28	0.04 ± 0.21	0.03 ± 0.20	0.07 ± 0.29		
Garbage & Recycling Facilities Outside	28,171	2,317 (4.4)	0.03 ± 0.25	0.07 ± 0.32	-	0.09 ± 0.35		
Lighting & Ventilation	25,313	2,172 (4.1)	0.02 ± 0.16	0.08 ± 0.29	0.00 ± 0.00	0.08 ± 0.29		
Ware Washing	23,914	2,164 (4.1)	0.08 ± 0.29	0.04 ± 0.19	0.03 ± 0.18	0.05 ± 0.22		
Use of Thermometers & Test Kits	25,039	2,098 (4.0)	0.06 ± 0.25	0.03 ± 0.19	0.00 ± 0.06	0.08 ± 0.30		
Handwashing & Handwash Sinks	28,171	2,084 (3.9)	0.06 ± 0.28	0.03 ±0.18	0.05 ± 0.25	0.03 ± 0.19		
Approved Food Sources	28,171	1,920 (3.6)	0.07 ± 0.39	0.00 ± 0.00	0.07 ± 0.41	0.01 ± 0.10		
Date-marking & Labeling	28,171	1,243 (2.3)	0.04 ± 0.23	0.00 ± 0.00	0.03 ± 0.18	0.02 ± 0.16		
Wiping Clothes	21,648	1,195 (2.3)	0.05 ± 0.28	0.00 ± 0.03	0.00 ± 0.03	0.06 ± 0.29		

Table 3. Number of Different Types of Violations in 31 Categories $(N = 28, 171)$								
		No. of Violations in	Mean number of violations per each facility ± Standard Devia					
		Each Category	Behavioral	Non-behavioral	Critical	Non-critical		
Violation Categories	n ^a	(%) ^b	Violations	Violations	Violations	Violations		
Storage of Toxic Items & Personal Items	28,171	1,098 (2.1)	0.05 ± 0.22	0.00 ± 0.00	0.04 ± 0.21	0.00 ± 0.07		
Use of Single-use Gloves & Utensils/Bare Hand Contact	20,645	1,047 (2.0)	0.05 ± 0.27	0.00 ± 0.04	0.02 ± 0.20	0.03 ± 0.19		
Waste Water & Sewage	28,171	835 (1.6)	0.00 ± 0.00	0.03 ± 0.21	0.01 ± 0.11	0.02 ± 0.21		
Display of Valid Permit & Consumer Advisories	21,374	739 (1.4)	0.03 ± 0.24	0.01 ± 0.08	0.01 ± 0.08	0.03 ± 0.25		
Toilets	25,039	693 (1.3)	0.02 ± 0.17	0.03 ± 0.19	0.00 ± 0.01	0.03 ± 0.20		
Personal Cleanliness & Grooming	28,171	662 (1.3)	0.02 ± 0.16	0.00 ± 0.00	0.01 ± 0.10	0.02 ± 0.14		
Person in Charge	24,552	420 (0.8)	0.02 ± 0.13	_	0.01 ± 0.11	0.01 ± 0.09		
Adequate Equipment for Cold/Hot Holding	20,665	402 (0.8)	0.01 ± 0.11	0.01 ± 0.10	0.01 ± 0.12	0.01 ± 0.09		
Water & Ice Supply	28,171	343 (0.6)	0.00 ± 0.07	0.01 ± 0.09	0.01 ± 0.08	0.01 ± 0.09		
Cooling	22,084	296 (0.6)	0.01 ± 0.12	_	0.01 ± 0.09	0.01 ± 0.08		
Employee Health	28,171	275 (0.5)	0.01 ± 0.14	0.00 ± 0.00	0.01 ± 0.15	0.00 ± 0.02		
Thawing	25,039	212 (0.4)	0.01 ± 0.09	_	0.00 ± 0.03	0.01 ± 0.08		
Cooking	23,813	79 (0.1)	0.00 ± 0.07	_	0.00 ± 0.06	0.00 ± 0.04		
Reheating	22,084	67 (0.1)	0.00 ± 0.06	_	0.00 ± 0.06	0.00 ± 0.00		
Other	25,281	731 (1.4)	0.02 ± 0.15	0.02 ± 0.15	0.00 ± 0.04	0.03 ± 0.20		
Total Violations		52,900						

^a Numbers included in data analyses for food code categories differ due to missing data. Some states did not have food code violations in certain categories. See State data tables in appendices for more specific missing data information.
 ^b Total number of violations within each category. If a facility had multiple violations in any categories, we recorded number of violations instead of number of facilities that violated food code items in each category.

Results and Discussion

The mean number of violations per inspection was 1.94 ± 2.68 ranging from no violations to 48 food code violations. Table 4 presents the number of food code violations per school. Greater than 55% of schools had no or one violations. This suggests that some schools should be inspected more often than others to monitor safe food handling, which is the intent of risk-based inspections. On the other hand, schools that receive no violations or no critical violations may only need to be inspected on an annual basis. On average, school nutrition operations were cited for 1.31 ± 2.14 behavioral violations and 0.78 ± 1.27 non-behavioral violations. In addition, 0.58 ± 0.16 critical violations and 1.41 ± 2.11 non-critical violations were cited in health inspection reports.

Table 4. Number of Food Code Violations per School (N=28,171)						
	Number (%)					
No violations	9,146 (32.5)					
1 violation	6,594 (23.4)					
2 violations	4,854 (17.2)					
3 violations	775 (10.5)					
Greater than 3 violations	4,524 (16.0)					

Frequently Cited Food Code Violation Categories

The top five most frequently cited food code violation categories in school nutrition

operations were *Premises and Equipment Maintenance* (n = 9,797, 18.5%) followed by

Protecting Food From Contamination (n = 3,355, 6.3%), Pest and Animal Control (n = 3,247,

6.1%), Use of Utensils and Linens (n = 3,133, 5.9%), and Non-food Contact Surface

Maintenance (n = 2,988, 5.6%). Regardless of behavioral or non-behavioral violations, Premises

and Equipment Maintenance had the highest numbers of violations (Table 3). Data in Table 3 should be interpreted with caution because the number of schools from each state varied greatly.

Analyses of ranked values for the five most prevalent violation categories in each state revealed that *Premises and Equipment Maintenance* was again the predominant violation category (Table 5). In 18 of 21 states, this was in the top five food code violation categories. *Protecting Food From Contamination* was among the top five violations in 13 states, followed by *Non-food Contact Surface Maintenance* (among the top five in 11 states), *Time and Temperature Control* (among the top five in nine states), and *Ware Washing* (among the top five in nine states). This ranking differs from the ranking based on frequencies of citations in the entire sample (Table 3) because we reduced the skewing effect of states with a large number of schools.

Violations in the *Premises and Equipment Maintenance* category tended to have lower food safety risks and would less likely cause foodborne illnesses than violations related to handling potentially hazardous food (PHF) or time and temperature control for safety (TCS) food handling. In addition to examples shown in Table 2, other specific violations in this category include:

- Bearings and gear boxes: leak proof
- Equipment: good repair and proper adjustment
- Premises maintained free of litter, unnecessary articles removed, storage in an orderly manner
- Dressing rooms/lockers adequate, clean

Although *Pest and Animal Control* (n=3,247, 6.1%) was the third most prevalent violation category overall (Table 3), it was not significant across all states. Violations in this category were most prevalent in New York, but no other states had this category included as one of top five most prevalent food code violations. We cannot conclude that other states did not have issues with pest and animal control because some health inspection reports did not always include violations in this category on their reports.

Table 5. Top Five Food Code Violation Categories Ranked by States (n = 21)							
	Number of States (Total = 21 States)						Mean
Violation Categories	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Total	Ranking ^a
Premises & Equipment Maintenance	14	1	2	2	0	18	3.8 ± 1.9
Protecting Food from Contamination	1	3	1	2	6	13	1.4 ± 1.6
Non-food Contact Surface Maintenance	0	5	1	2	3	11	1.4 ± 1.7
Time & Temperature Control	1	2	1	3	2	9	1.1 ± 1.6
Ware Washing	1	0	5	0	3	9	1.1 ± 1.5
Food Contact Surface Maintenance	2	0	2	2	1	7	1.0 ± 1.7
Plumbing & Adequate Toilet Facilities	0	2	1	1	1	5	0.7 ± 1.4
Use of Thermometers & Test Kits	1	1	0	1	2	5	0.6 ± 1.4
Garbage & Recycling Facilities Outside	0	0	3	2	1	5	0.6 ± 1.1
Lighting & Ventilation	0	1	2	1	0	4	0.6 ± 1.2
Use of Utensils & Linens	0	2	1	0	1	4	0.6 ± 1.3
Approved Food Sources	1	0	1	1	0	3	0.5 ± 1.3
Handwashing & Handwash Sinks	0	1	0	2	1	4	0.4 ± 1.0

^a Mean ranking was calculated with Rank 1 = 5 points, Rank 2 = 4 points, Rank 3 = 3 points, Rank 4 = 2 points, Rank 5 = 1 point, and all others = 0 point

The *Use of Utensils & Linens* category, the fourth most prevalent food code violation category overall (Table 3), was one of top five challenges in only four states and was not a widespread challenge. These results indicate that frequency alone does not fully explain widespread food safety challenges in school nutrition operations across the U.S.

Figures 2 through 9 illustrate each state's performance on selected violation categories based on percentages of total violations for each category in each that state. Figure 2, *Premise and Equipment Maintenance* Violations in 21 States, shows that this category presents the most widespread and challenging issues in school nutrition operations. In Florida, Hawaii, and Maryland (Red colored), for example, more than 30% of total violations involved *Premise and Equipment Maintenance*. Only three states, Alaska, Idaho, and Rhode Island, had 5% or fewer total violations in this category.

Protecting Food From Contamination (Figure 3) was the second most prevalent food safety violation category in school nutrition operations (6.3% of total violations). It was also among the top five food code violation categories in 13 of 21 states in the sample (Figure 3). Four Five states had more than 10% of total violations in this category (Missouri, North Dakota, New Hampshire, New Mexico, and Wisconsin.MO, ND, NH, and WI).

Pest and Animal Control (Figure 4), while being the third most prevalent food safety violation category (6.1% of total violations), 17 of the 21 states had less than 5% of total violations in this category. New York had the highest total violations in this category (15-19% of total violations). *Use of Utensils and Linens* (Figure 5) was also low in total violations by state. Of the 21 states, 16 had less than 5% of total violations in this category.

When exploring violations related to *Non-food Contact Surface Maintenance* (Figure 6), most states (15 of 21) had 9% of their total violations in this category, while two states did not report this category on their inspection forms. All 21 states in the sample had fewer than 9% of total violations in the *Plumbing and Adequate Toilet Facilities* (Figure 7), with 12 states having less than 5% of total violations in this category.

The *Time and Temperature Control* category (Figure 8) was also low in total violations per state, with only Wyoming having greater than 10% of total violations in this area. In regards to *Food Contact Surface Maintenance* (Figure 9), only three states (Alaska, Idaho, and Wisconsin) were in the 10-14% of total violations range, while the rest were below 9% of total violations.

Of course, inspections are not consistent across states; not all categories were included in every state. For example, the *Adequate Equipment for Cold/Hot Holding* category was not included in health inspection reports for six of 21 states, and the *Cooling*, *Reheating*, and *Cooking* categories were missing in five of 21 states. Therefore, our data may not indicate food handling challenges in these categories in some states. Missing violation categories in each state inspection are summarized in Appendix A.



Figure 2. Percentage of *Premise and Equipment Maintenance* Violations in 21 States



Figure 3. Percentage of Protecting Food from Contamination Violations in 21 States



Figure 4. Percentage of Pest and Animal Control Violations in 21 States







Figure 6. Percentage of Non-food Contact Surface Maintenance Violations in 21 States



Figure 7. Percentage of *Plumbing and Adequate Toilet Facilities* Violations in 21 States



Figure 8. Percentage of *Time and Temperature Control* Violations in 21 States



Figure 9. Percentage of Food Contact Surface Maintenance Violations in 21 States
A surprising finding specific to Rhode Island related to *Approved Food Sources*. More than 12% of total violations in Rhode Island fell into this category. When investigated further, it was found that most of these violations involved purchasing unpasteurized eggs. Both Federal and the Rhode Island Food Code prohibit using unpasteurized eggs for producing partly cooked food or raw eggs as an ingredient without further cooking. Such food items include salad dressings, sauces like Hollandaise or Béarnaise, mayonnaise, meringue, ice cream, or beverages containing raw eggs. It is not a common practice for school nutrition operations to prepare these types of food items. If schools do not prepare such foods, purchasing unpasteurized eggs does not pose a food safety threat. Further investigation is needed to determine how raw eggs are being used in schools and how the Rhode Island Food Code was interpreted.

Frequently Cited Behavioral and Non-behavioral Food Code Violations

While most food code violations reflected facility and maintenance issues that are beyond the direct control of school nutrition employees' responsibilities, we also identified several behavior related challenges. Table 3 shows the *Premises and Equipment Maintenance* category had the most behavioral food code violations (0.19 \pm 0.53), so nutrition employees must work on maintenance to improve the safety of food. The next four highest behavioral food code violations in school nutrition operations were *Protecting Food from Contamination* (0.12 \pm 0.37), *Use of Utensils and Linens* (0.11 \pm 0.44), *Time and Temperature Control* (0.08 \pm 0.30), and *Non-food Contact Surface Maintenance* (0.08 \pm 0.30). Within these categories, specific employee behaviors such as preventing cross contamination of raw and cooked foods, proper storage and handling of clean and sanitized equipment, hot food held above 135°F, and nonfood-contact surfaces properly maintained were included. Specific behavior modification strategies and training efforts should be explored to improve these behaviors. As already noted, the *Premises and Equipment Maintenance* category had the highest number of non-behavioral food code violations (0.21 ± 0.56) . The mean score of 0.21 can be interpreted that one in every five-school nutrition operations had one violation related to premise and equipment maintenance issues. This is a significant challenge for school nutrition operations; this violation was identified as one of the five most prevalent violations in 18 states (Table 4). Other non-behavior related violations were much less frequent at 0.08 (*Lighting & Ventilation*) or 0.07 (*Plumbing & Adequate Toilet Facilities, Garbage & Recycling Facilities Outside,* and *Pest & Animal Controls*). Employee training will not solve these problems; school administrators must improve physical facilities and maintenance.

Although these violations may not pose direct threats to food safety, the public may not be aware of the different types of food code violations (behavioral versus non-behavioral, high risk versus low risk). Therefore, school nutrition directors should continue to improve facilities so these facility-related violations do not occur repeatedly. Table 3 provides more information about violations in the 21 states, including data related to behavioral versus non-behavioral violations. Data from each state are included in Appendix B.

Variations among States

It is important to note that no two states used the same health inspection forms. Appendix A shows several food code violation categories that were not included in different state inspection reports. Although some of the categories are not necessary in identifying imminent food safety risks, others are required for risk assessment. Some inspection forms omitted important food safety categories, which made identifying risks difficult. For example, inspection reports from six states did not include food code violations for *Adequate Equipment for Cold/Hot Holding* (CO, FL, HI, MD, RI, and WI). Five states did not include food code violations for

proper cooling (AL, HI, KY, NH, and OH), cooking (AL, CO, HI, KY, and NH), and reheating (AL, HI, KY, NH, and OH).

This study reviewed food safety inspection reports across multiple states using a predetermined list of categories to identify specific food safety risks. Even though there were some code categories missing, the large number of schools across multiple states allowed the researchers to identify risks.

If proper food handling procedures are not followed or facilities are not maintained to reduce food safety risks, the possibility of foodborne illness outbreaks increases. Environmental health authorities may investigate the value of inspection procedures for reinforcing proper food handling behaviors and eventually reduce foodborne illness outbreaks in their states and municipalities.

Conclusions

This project may be the first to investigate food safety inspection reports for schools across the U.S., not just to identify food safety risks, but also to identify operational and behavioral changes needed in school nutrition operations. Although the 21 states differed in their food safety inspection systems, researchers identified specific food safety risks and ways to improve food safety inspection reports using predetermined food code violation categories.

There was a wide variation in the number of violations in the schools, which supports the need for risk-based inspections. Nearly a third (32.5%) of the schools had no violations while another 23% had only one violation. Three or more violations were identified in 26.5% of the schools, and it is these schools that clearly need the most oversight by health inspectors. These

data suggest that the number of inspections needed by any school should be based on the number of violations received, especially the number of critical violations.

The food code violations most prevalent in school nutrition operations were those least likely to contribute to foodborne illness outbreaks. *Premises and Equipment Maintenance* was one of five most prevalent violation categories in 18 of 21 states, and numbers of both behavioral and non-behavioral violations in this category were the highest and most widely spread. Therefore, in addition to working with administrators to improve facilities, food safety training should include proper methods of cleaning and maintaining facilities.

Among behavioral violations, two had the highest mean scores: *Protecting Food from Contamination* and *Use of Utensils and Linens*. School nutrition directors should consider these two important behavioral challenges when providing food safety training. Based on inspection data, the training content should also include *Time and Temperature Control* and *Food Contact Surface Maintenance*.

Age and poor maintenance of school nutrition equipment and facilities are the cause of many of the non-behavioral food code violations. School nutrition directors and/or school district administrators need to review inspection reports and identify measures that can be taken to improve facilities and equipment. Employees can do little about these violations, and without organizational commitment, school nutrition operations will continue to be cited for these violations in health inspections. Moreover, if employees see violations they cannot prevent and violations due to the lack of commitment from the administration, their motivation to comply with other areas of the food code may diminish.

Analysis of Health Inspection Reports for School Foodservice Operations in the U.S.: Summary Report

P a g e | **31**

Because state food safety inspection systems differ substantially, inspection scores among states cannot be compared. These data do provide an overall view of common violations across many states, and consistencies were identified.

Recommendations

Based on this research, we have several recommendations to improve food safety practices and health inspection reports in school nutrition operations:

- School nutrition operations had the largest number of behavioral and non-behavioral food code violations in the category of facility and equipment maintenance. Although food safety risks associated with these violations are minimal, the public and media may not differentiate types and risks of food code violations found in school nutrition operations. Therefore, child nutrition professionals should improve their health inspection reports by:
 - a. Sharing the health inspection data with school administrators to justify financial support to improve facilities and equipment, and
 - b. Training employees on how to properly clean and maintain facilities and equipment.
- 2. Conduct an assessment of the need for a Federal requirement for two health inspections each year for schools. This assessment would incorporate information from:
 - a. This national study of health inspection reports.
 - Epidemiological data related to foodborne illness outbreaks associated with school nutrition programs.
 - c. Efforts by USDA Food and Nutrition Service to reduce the risk factors related to foodborne illness outbreaks in schools. These efforts include the development of educational programs and materials by the Agency and partner national institutes

funded by USDA, including the National Food Service Management Institute and the Center of Excellence for Food Safety Research in Child Nutrition Programs.

d. Environmental Health standards and practices emphasizing risk-based inspections and program standardization. These efforts could be coordinated with the FDA Center for Food Safety and Nutrition, which is responsible for developing the Model Food Code, and the National Environmental Health Association, which is the professional association for environmental health professionals.

References

- Centers for Disease Control and Prevention. (2011). Surveillance for foodborne disease outbreaks-United States, 2008. *Morbidity and Mortality Weekly Report*, 60, 1197-1202. Retrieved from http://www.cdc.gov/mmwr/pdf/wk/mm6035.pdf
- Chapman, B., Eversley, T., Fillion, K., MacLaurin, T., & Powell, D. (2010). Assessment of food safety practices of food service food handlers (risk assessment data): Testing a communication intervention (evaluation of tools). *Journal of Food Protection*, 73, 1101-1107.
- Henroid, D., & Sneed, J. (2003). Readiness to implement hazard analysis and critical control point (HACCP) systems in Iowa schools. *Journal of the American Dietetic Association*, 104, 180–185.
- Harris, K. J., DiPietro, R. B., Murphy, K. S., & Rivera, G. (2014). Critical food safety violations in florida: Relationship to location and chain vs. non-chain restaurants. *International Journal of Hospitality Management*, 38(0), 57-64. doi: 10.1016/j.ijhm.2013.12.005
- Jones, T. F., & Angulo, F. J. (2006). Eating in restaurants: A risk factor for foodborne disease? *Clinical Infectious Diseases, 43*(10), 1324-1328.
- Kwon, J., Choi, Y. G., Liu, P., & Lee, Y. M. (2012). Food safety training needed for Asian restaurants: Review of multiple health inspection data in Kansas. *Journal of Foodservice Management & Education*, 6(2), 10-15.
- Kwon, J., Roberts, K., Shanklin, C. W., Liu, P., & Yen, W. S. (2010). Food safety training need assessment for independent ethnic restaurants: Review of health inspection data in Kansas. *Food Protection Trends*, 30, 412-421.
- Lynch, M., Painter, J., Woodruff, R., & Braden, C. (2006). Surveillance for foodborne-disease outbreaks – United States, 1998-2002. *Morbidity and Mortality Weekly Report*, 55(10), 1-34. Retrieved from http://www.cdc.gov/MMWr/preview/mmwrhtml/ss5510a1.htm
- Papadopoulos, A., Sargeant, J. M., Majowicz, S. E., Sheldrick, B., McKeen, C., Wilson, J., & Dewey, C. E. (2012). Enhancing public trust in the food safety regulatory system. *Health Policy*, 107(1), 98-103. doi: 10.1016/j.healthpol.2012.05.010
- Phillips, M. L., Elledge, B. L., Basara, H. G., Lynch, R. A., & Boatright, D. T. (2006). Recurrent critical violations of the food code in retail food service establishments. *Journal of Environmental Health*, 68(10), 24-30.

- Realmuto, L., Hunting, K., L., & Parkin, R. (2013). State health agency workforce shortages and implications for public health: A case study of restaurant inspections in Louisiana. *Journal* of Environmental Health, 76(5), 32-37.
- Roberts, K. R., Barrett, B. B., Howells, A. D., Shanklin, C. W., Pilling, V. K., & Brannon, L. A. (2008). Food safety training and foodservice employees' knowledge and behavior. *Food Protection Trends*, 28, 252-260.
- Roberts, K. R., Kwon, J., Shanklin, C. W., Liu, P., & Yen, W. S. F. (2011). Food safety practices lacking in independent ethnic restaurants. *Journal of Culinary Science and Technology*, 9(1), 1-16.
- U.S. Department of Agriculture, Food and Nutrition Services. (2012). National School Lunch Program. Retrieved from http://www.fns.usda.gov/cnd/lunch/AboutLunch/NSLPFactSheet.pdf

APPENDIX A:

Food Code Violation Categories Missing in State Inspection Reports

Food Code	Violation Cate	gories Missing in State Inspection Reports	~
	No of		Critical
G 4 4	Inspection		Violation
State	Codes	Missing Violation Categories	Specified
Alaska	55	None	Yes
Alabama	42	Cooling	Yes
		Reheating	
~		Cooking	
Colorado	195	Cooking	Yes
		Adequate Equipment for Cold/Hot Holding	
	4.4	Ware Washing	37
Florida	44	Adequate Equipment for Cold/Hot Holding	Yes
		Use of Single-use Gloves & Utensils/Bare	
		Hand Contact	
		wiping Clothes	
		Food Contact Surface Maintenance	
		Non-1000 Contact Surface Maintenance	
		Advisories	
Howaii	24	Advisories Derson in Change	Vac
Пажан	54	Cooling	1 68
		Deheating	
		Cooking	
		Thewing	
		A dequate Equipment for Cold/Hot	
		Holding	
		Use of Thermometers & Test Kits	
		Use of Single-use Gloves &	
		Utensils/Bare Hand Contact	
		Toilets	
		Display of Valid Permit & Consumer	
		Advisories	
Idaho	122	None	Yes
Kentucky	38	Cooling	Yes
	00	Reheating	1.00
		Cooking	
		Use of Single-use Gloves & Utensils/Bare	
		Hand Contact	
Louisiana	168	Person in Change	No
Maryland	37	Adequate Equipment for Cold/Hot Holding	Yes
		Non-food Contact Surface Maintenance	
Michigan	330	None	Yes
Missouri	352	None	Yes

	No of		Critical
State	Inspection	Missing Violation Categories	Violation Specified
North	216	None	<u>Specifica</u>
Dakota	210	none	res
New	44	Person in Change	Yes
Hampshire		Cooling	
		Reheating	
		Cooking	
		Wiping Clothes	
		Display of Valid Permit & Consumer	
		Advisories	
New Mexico	211	None	Yes
New York	66	Person in Change	Yes
Ohio	43	Cooling	No
		Reheating	
		Thawing	
		Use of Thermometers & Test Kits	
		Use of Single-use Gloves & Utensils/Bare	
		Hand Contact	
		Wiping Clothes	
		Ware Washing	
		Toilets	
		Lighting and Ventilation	
		Pest & Animal Controls	
		Display of Valid Permit & Consumer	
		Advisories	
Oklahoma	52	Waste Water & Sewage	Yes
Pennsylvania	208	None	Yes
Rhode Island	55	Adequate Equipment for Cold/Hot Holding	Yes
Virginia	415	None	Yes
Wisconsin	55	Adequate Equipment for Cold/Hot Holding	Yes

APPENDIX B:

Mean Number of Food Code Violations in 31 Categories by State

Mean Number of Food Code violations in 31 Categories by State: Alaska ($n = 270$)								
	No. of Violations	Mean nur	nber of violations per f	facility ± Standard	Deviation			
Violation Categories	in Each Category(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations			
Person in Change	27 (7.2)	0.10 ± 0.30	_	0.10 ± 0.30	_			
Employee Health	11 (2.9)	0.04 ± 0.29	_	0.04 ± 0.29	_			
Handwashing & Handwash Sinks	46 (12.2)	0.17 ± 0.42	_	0.17 ± 0.42	_			
Personal Cleanliness & Grooming	11 (2.9)	0.04 ± 0.20	_	_	0.04 ± 0.20			
Approved Food Sources Protecting Food from	4 (1.1)	0.01 ± 0.12	-	0.01 ± 0.12	0.00 ± 0.00			
Contamination	26 (1.1)	0.10 ± 0.35	—	0.05 ± 0.21	0.05 ± 0.21			
Cooling	0 (0.0)	0.00 ± 0.00	_	0.00 ± 0.00	_			
Reheating	0 (0.0)	0.00 ± 0.00	_	0.00 ± 0.00	_			
Cooking	0 (0.0)	0.00 ± 0.00	_	0.00 ± 0.00	0.00 ± 0.00			
Thawing	1 (0.3)	0.00 ± 0.06	_	_	0.00 ± 0.06			
Time & Temperature Control Adequate Equipment for Cold/Hot	9 (2.4)	0.03 ± 0.18	_	0.03 ± 0.18	-			
Holding	2 (0.5)	_	0.01 ± 0.09	_	0.01 ± 0.09			
Date-marking & Labeling	4 (1.1)	0.01 ± 0.12	_	_	0.01 ± 0.12			
Use of Thermometers & Test Kits ^b Use of Single-use Gloves &	24 (6.4)	0.09 ± 0.29	0.09 ± 0.29	_	0.09 ± 0.29			
Utensils/Bare Hand Contact	8 (2.1)	0.03 ± 0.17	-	0.01 ± 0.11	0.02 ± 0.14			
Use of Utensils & Linens	11 (2.9)	0.04 ± 0.20	_	_	0.01 ± 0.20			
Wiping Clothes	14 (3.7)	0.05 ± 0.22	_	_	0.05 ± 0.22			
Food Contact Surfaces ^b	55 (14.6)	0.20 ± 0.44	0.09 ± 0.29	0.11 ± 0.32	_			
Non-food Contact Surfaces	1 (0.3)	0.00 ± 0.06	_	_	0.00 ± 0.06			
Ware Washing ^b	28 (7.4)	0.10 ± 0.31	0.10 ± 0.31	_	0.10 ± 0.31			

Water & Ice Supply	0	(0.0)	_	0.00 ± 0.00	_	0.00 ± 0.00
Waste Water & Sewage	0	(0.0)	_	0.00 ± 0.00	_	0.00 ± 0.00
Plumbing & Adequate Toilet						
Facilities	11	(2.9)	_	0.04 ± 0.20	_	0.04 ± 0.20
Toilets ^b	2	(0.5)	0.01 ± 0.09	0.01 ± 0.09	_	0.01 ± 0.09
Premises & Equipment						
Maintenance ^b	11	(2.9)	0.04 ± 0.20	0.04 ± 0.20	_	0.04 ± 0.20
Lighting & Ventilation	11	(2.9)	_	0.01 ± 0.20	_	0.01 ± 0.20
Garbage & Recycling Facilities						
Outside ^b	0	(0.0)	0.00 ± 0.00	0.00 ± 0.00	_	0.00 ± 0.00
Pest & Animal Controls	9	(2.4)	0.03 ± 0.18	_	_	0.03 ± 0.18
Storage of Toxic Items & Personal						
Items	20	(5.3)	0.07 ± 0.26	_	0.07 ± 0.26	0.00 ± 0.00
Display of Valid Permit &						
Consumer Advisories	0	(0.0)	0.00 ± 0.00	—	_	0.00 ± 0.00
Other	31	(8.2)	0.11 ± 0.35	_	0.06 ± 0.29	0.05 ± 0.22
Total Violations	377					

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.
^b These violation categories included food code violations with both behavioral and non-behavioral components, and researchers were not able to discern

which from the health inspection data.

Mean Number of Food Code Violations in 31 Categories by State: Alabama (n = 1,316)							
	No. of Violations Mean number of violations per facility ± Standard Deviati						
Violation Categories	in Each Category(%)ª	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Person in Change	7 (0.2)	0.01 ± 0.07	_	0.01 ± 0.07			
Employee Health	2 (0.1)	0.00 ± 0.04	_	0.00 ± 0.04	_		
Handwashing & Handwash Sinks	104 (3.5)	0.08 ± 0.28	_	0.03 ± 0.17	0.05 ± 0.22		
Personal Cleanliness & Grooming	24 (0.8)	0.02 ± 0.13	_	_	0.02 ± 0.13		
Approved Food Sources Protecting Food from	9 (0.3)	0.01 ± 0.08	_	0.01 ± 0.08	-		
Contamination	142 (4.8)	0.11 ± 0.32	_	0.01 ± 0.10	0.10 ± 0.30		
Cooling	_	_	-	_	_		
Reheating	_	_	-	_	_		
Cooking	_	_	-	_	_		
Thawing	8 (0.3)	0.01 ± 0.08	_	_	0.01 ± 0.08		
Time & Temperature Control Adequate Equipment for Cold/Hot	78 (2.6)	0.06 ± 0.24	-	0.06 ± 0.24	-		
Holding	42 (1.4)	0.03 ± 0.18	-	-	0.03 ± 0.18		
Date-marking & Labeling	86 (2.9)	0.07 ± 0.25	_	_	0.07 ± 0.25		
Use of Thermometers & Test Kits Use of Single-use Gloves &	54 (1.8)	0.04 ± 0.20	-	_	0.04 ± 0.20		
Utensils/Bare Hand Contact	62 (2.1)	0.05 ± 0.21	_	_	0.05 ± 0.21		
Use of Utensils & Linens	140 (4.7)	0.11 ± 0.33	_	_	0.11 ± 0.33		
Wiping Clothes	73 (2.5)	0.06 ± 0.23	_	_	0.06 ± 0.23		
Food Contact Surfaces	67 (2.3)	0.05 ± 0.22	_	_	0.05 ± 0.22		
Non-food Contact Surfaces	395 (13.4)	0.23 ± 0.42	0.25 ± 0.45	_	0.48 ± 0.65		
Ware Washing ^b	68 (2.3)	0.05 ± 0.22	0.05 ± 0.22	_	0.05 ± 0.22		

Mean Number of Food Code Violations in 31 Categories by State: Alabama (n = 1,316)								
	No. of	Violations	Mean number of violations per facility ± Standard Deviation					
Violation Categories	in Each Category(%) ^a		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Water & Ice Supply	1	(0.0)	_	0.00 ± 0.03	0.00 ± 0.03	_		
Waste Water & Sewage Plumbing & Adequate Toilet	24	(0.8)	_	0.02 ± 0.13	0.02 ± 0.13	-		
Facilities	209	(7.1)	_	0.16 ± 0.38	_	0.16 ± 0.38		
Toilets ^b Premises & Equipment	25	(0.8)	0.02 ± 0.14	0.02 ± 0.14	-	0.02 ± 0.14		
Maintenance	710	(7.1)	0.01 ± 0.10	0.53 ± 0.63	_	0.54 ± 0.64		
Lighting & Ventilation Garbage & Recycling Facilities	283	(0.8)	_	0.22 ± 0.42	_	0.22 ± 0.42		
Outside	173	(5.8)	_	0.13 ± 0.34	_	0.13 ± 0.34		
Pest & Animal Controls Storage of Toxic Items & Personal	26	(0.9)	0.01 ± 0.11	0.01 ± 0.09	0.01 ± 0.11	0.01 ± 0.09		
Items Display of Valid Permit &	54	(1.8)	0.04 ± 0.20	0.00 ± 0.00	0.02 ± 0.12	0.03 ± 0.16		
Consumer Advisories	14	(0.5)	0.01 ± 0.10	0.00 ± 0.00	_	0.01 ± 0.10		
Other	78	(2.6)	0.04 ± 0.19	0.02 ± 0.15	_	0.06 ± 0.25		
Total Violations	2,958							

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.
^b These violation categories included food code violations with both behavioral and non-behavioral components, and researchers were not able to discern which from the health inspection data.

Weat Number of Food Code violations in 51 Categories by State: Colorado ($II = 1,129$)									
	No. of Violations	Mean nun Behavioral	nber of violations per i	facility ± Standard Deviation Behavioral Non-critical					
Violation Categories	Category(%) ^a	Violations	Violations	Violations	Violations				
Person in Change	22 (0.8)	0.02 ± 0.15	_	0.01 ± 0.12	0.01 ± 0.08				
Employee Health	7 (0.3)	0.01 ± 0.08	_	0.00 ± 0.04	0.00 ± 0.07				
Handwashing & Handwash Sinks	173 (6.4)	0.08 ± 0.27	0.08 ± 0.28	0.08 ± 0.27	0.08 ± 0.28				
Personal Cleanliness & Grooming	150 (5.5)	0.13 ± 0.37	_	0.13 ± 0.37	0.00 ± 0.00				
Approved Food Sources Protecting Food from	228 (8.4)	0.20 ± 0.43	-	0.12 ± 0.33	0.08 ± 0.28				
Contamination	3 (0.1)	0.00 ± 0.00	0.00 ± 0.05	0.00 ± 0.05	0.00 ± 0.00				
Cooling	0 (0.0)	0.00 ± 0.00	_	0.00 ± 0.00	0.00 ± 0.00				
Reheating	7 (0.3)	0.01 ± 0.08	_	0.01 ± 0.08	_				
Cooking	—	_	_	_	_				
Thawing	0 (0.0)	0.00 ± 0.00	_	_	0.00 ± 0.00				
Time & Temperature Control Adequate Equipment for Cold/Hot Holding	208 (7.7)	0.18 ± 0.44 -	_	0.18 ± 0.44 -	_				
Date-marking & Labeling	41 (1.5)	0.04 ± 0.19	_	_	0.04 ± 0.19				
Use of Thermometers & Test Kits Use of Single-use Gloves &	367 (13.5)	0.33 ± 0.59	_	_	0.33 ± 0.59				
Utensils/Bare Hand Contact	59 (2.2)	0.05 ± 0.22	_	_	0.05 ± 0.22				
Use of Utensils & Linens	60 (2.2)	0.05 ± 0.23	_	_	0.05 ± 0.23				
Wiping Clothes	83 (3.1)	0.07 ± 0.26	-	_	0.07 ± 0.26				

Mean Number of Food Code Violations in 31 Categories by State: Colorado (n = 1,129)

	No. of V	iolations	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in E Catego	Cach ory(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Food Contact Surfaces	158	(5.8)	0.06 ± 0.23	0.08 ± 0.28	_	0.14 ± 0.37	
Non-food Contact Surfaces	235	(8.7)	0.09 ± 0.29	0.12 ± 0.33	_	0.21 ± 0.47	
Ware Washing	-	_	_	_	_	_	
Water & Ice Supply	30	(1.1)	0.00 ± 0.04	0.02 ± 0.16	0.03 ± 0.16	0.00 ± 0.00	
Waste Water & Sewage Plumbing & Adequate Toilet	65	(2.4)	_	0.06 ± 0.23	0.06 ± 0.23	0.00 ± 0.00	
Facilities	153	(5.6)	_	0.14 ± 0.34	0.00 ± 0.00	0.14 ± 0.34	
Toilets Premises & Equipment	21	(0.8)	_	0.02 ± 0.14	_	0.02 ± 0.14	
Maintenance	234	(8.6)	0.15 ± 0.36	0.06 ± 0.25	_	0.21 ± 0.44	
Lighting & Ventilation Garbage & Recycling Facilities	124	(4.6)	_	0.11 ± 0.32	_	0.11 ± 0.32	
Outside	43	(1.6)	_	0.04 ± 0.19	_	0.04 ± 0.19	
Pest & Animal Controls Storage of Toxic Items & Personal	55	(2.0)	0.05 ± 0.22	_	0.05 ± 0.22	0.00 ± 0.00	
Items Display of Valid Permit &	177	(6.5)	0.16 ± 0.41	-	0.16 ± 0.41	_	
Consumer Advisories	0	(0.0)	0.00 ± 0.00	_	_	0.00 ± 0.00	
Other	11	(0.4)	0.01 ± 0.12	0.00 ± 0.00	0.00 ± 0.03	± 0.11	
Total Violations	2,958						

Mean Number of Food Code Violations in 31 Categories by State: Colorado (n = 1,129)

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

Mean Number of Food Code Violations in 31 Categories by State: Florida ($n = 3,210$)								
	No. of Violations Mean number of violations per fa				facility ± Standard	acility ± Standard Deviation		
Violation Categories	in E Catego	ach ry(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Person in Change	86	(1.4)	0.03 ± 0.16	_	0.03 ± 0.16	0.00 ± 0.00		
Employee Health	27	(0.4)	0.01 ± 0.09	_	0.01 ± 0.09	0.00 ± 0.00		
Handwashing & Handwash Sinks	264	(4.2)	0.02 ± 0.15	0.06 ± 0.24	0.08 ± 0.28	_		
Personal Cleanliness & Grooming	93	(1.5)	0.03 ± 0.17	_	_	0.03 ± 0.17		
Approved Food Sources Protecting Food from	13	(0.2)	0.00 ± 0.06	_	0.00 ± 0.06	-		
Contamination	363	(5.7)	0.11 ± 0.34	_	_	0.11 ± 0.34		
Cooling	100	(1.6)	0.03 ± 0.17	-	0.03 ± 0.17	_		
Reheating	16	(0.3)	0.00 ± 0.07	_	0.00 ± 0.07	_		
Cooking	3	(0.0)	0.00 ± 0.03	_	0.00 ± 0.03	_		
Thawing	19	(0.3)	0.01 ± 0.08	_	0.01 ± 0.08	_		
Time & Temperature Control Adequate Equipment for Cold/Hot	375	(5.9)	0.12 ± 0.32	_	0.12 ± 0.32	_		
Holding	-		—	—	—	—		
Date-marking & Labeling	404	(6.4)	0.13 ± 0.33	—	0.13 ± 0.33	_		
Use of Thermometers & Test Kits Use of Single-use Gloves &	446	(7.1)	0.14 ± 0.35	_	_	0.14 ± 0.35		
Utensils/Bare Hand Contact	_		_	_	_	_		
Use of Utensils & Linens	24	(0.4)	0.01 ± 0.09	—	_	0.01 ± 0.09		
Wiping Clothes	_		_	—	_	_		
Food Contact Surfaces	_		_	_	_	_		
Non-food Contact Surfaces	_		_	_	_	_		
Ware Washing	400	(6.3)	0.08 ± 0.28	0.04 ± 0.20	0.08 ± 0.28	0.04 ± 0.20		

Mean Number of Food Code Violations in 31 Categories by State: Florida $(n = 3,210)$								
	No. of V	iolations	Mean nur	nber of violations per	facility ± Standard	Deviation		
Violation Categories	in l Catego	Each ory(%)ª	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Water & Ice Supply	104	(1.6)	0.02 ± 0.12	0.02 ± 0.13	_	0.03 ± 0.18		
Waste Water & Sewage Plumbing & Adequate Toilet	22	(0.3)	_	0.01 ± 0.08	_	0.01 ± 0.08		
Facilities	336	(5.3)	0.05 ± 0.22	0.05 ± 0.23	0.05 ± 0.23	0.05 ± 0.22		
Toilets Premises & Equipment	92	(1.5)	_	0.03 ± 0.17	-	0.03 ± 0.17		
Maintenance	2,037	(32.3)	0.18 ± 0.39	0.56 ± 0.66	0.58 ± 0.75	0.06 ± 0.23		
Lighting & Ventilation Garbage & Recycling Facilities	90	(1.4)	_	0.03 ± 0.17	-	0.03 ± 0.17		
Outside	433	(6.9)	_	0.13 ± 0.34	_	0.13 ± 0.34		
Pest & Animal Controls Storage of Toxic Items & Personal	353	(5.6)	_	0.11 ± 0.31	-	0.11 ± 0.31		
Items Display of Valid Permit &	58	(0.9)	0.02 ±0.13	_	0.02 ± 0.13	_		
Consumer Advisories	-		_	_	_	_		
Other	158	(2.5)	0.10	0.04 ± 0.19	_	0.05 ± 0.22		
Total Violations	6,316							

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

Mean Number of Food Code Violations in 51 Categories by State: Hawaii $(n = 274)^{n}$							
	No. of Violations Mean number of violations per facility ± Standard Deviation						
	in Each	Behavioral	Non-behavioral	Behavioral	Non-critical		
Violation Categories	Category(%) ^b	Violations	Violations	Violations	Violations		
Person in Change	-	_	_	_	-		
Employee Health	0 (0.0%)	0.00 ± 0.00	0.00 ± 0.00	_	_		
Handwashing & Handwash Sinks	2 (0.9)	0.01 ± 0.09	0.00 ± 0.00	_	_		
Personal Cleanliness & Grooming	0 (0.0)	0.00 ± 0.00	0.00 ± 0.00	_	_		
Approved Food Sources Protecting Food from	4 (1.8)	0.01 ± 0.12	0.00 ± 0.00	_	_		
Contamination	25 (11.5)	0.09 ± 0.32	0.00 ± 0.00	_	_		
Cooling	_	_	_	_	_		
Reheating	—	_	_	_	_		
Cooking	—	_	_	_	_		
Thawing	_	_	_	_	_		
Time & Temperature Control Adequate Equipment for Cold/Hot	31 (14.3)	0.11 ± 0.36	0.00 ± 0.00	_	_		
Holding	_	_	_	_	_		
Date-marking & Labeling	5 (2.3)	0.02 ± 0.13	0.00 ± 0.00	_	_		
Use of Thermometers & Test Kits Use of Single-use Gloves &	-	-	-	-	-		
Utensils/Bare Hand Contact	—	_	_	_	_		
Use of Utensils & Linens	7 (3.2)	0.03 ± 0.16	0.00 ± 0.00	_	_		
Wiping Clothes	1 (0.5)	0.00 ± 0.03	0.00 ± 0.00	_	_		
Food Contact Surfaces	8 (3.7)	0.03 ± 0.17	0.00 ± 0.00	_	_		
Non-food Contact Surfaces	15 (6.9)	0.00 ± 0.00	0.05 ± 0.32	_	_		
Ware Washing	29 (13.4)	0.11 ± 0.37	0.00 ± 0.00	_	_		

Mean Number of Food Code Violations in 31 Categories by State: Hawaii (n = 274) ^a

Mean Number of Food Code Viola	weak Number of Food Code violations in 51 Categories by State: Hawan $(n = 2/4)^{n}$								
	No. of Violations	Mean number of violations per facility ± Standard Deviation							
Violation Categories	in Each Category(%) ^b	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations				
Water & Ice Supply	2 (0.9)	0.00 ± 0.00	0.01 ± 0.09	_	_				
Waste Water & Sewage Plumbing & Adequate Toilet	2 (0.9)	0.00 ± 0.00	0.01 ± 0.09	-	_				
Facilities	0 (0.0)	0.00 ± 0.00	0.00 ± 0.00	_	_				
Toilets Premises & Equipment	_	_	-	_	_				
Maintenance	69 (31.8)	0.14 ± 0.41	0.11 ± 0.39	_	_				
Lighting & Ventilation Garbage & Recycling Facilities	2 (0.9)	0.00 ± 0.00	0.01 ± 0.09	_	_				
Outside	10 (4.6)	0.00 ± 0.00	0.04 ± 0.21	_	_				
Pest & Animal Controls Storage of Toxic Items & Personal	3 (1.4)	0.00 ± 0.00	0.01 ± 0.10	_	_				
Items Display of Valid Permit &	0 (0.0)	0.00 ± 0.00	0.00 ± 0.00	_	_				
Consumer Advisories	_	—	_	_	_				
Other	2 (0.09)	0.00 ± 0.00	0.01 ± 0.09	_	_				
Total Violations	217								

^a The State of Hawaii health inspection data did not include consistent information whether certain violations were critical or non-critical. Therefore, our team decided not to address whether food code violations were critical or non-critical.

^b Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

	No. of Violations		Mean nun	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in Each Category(%) ^a		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Person in Change	3	(1.7)	0.01 ± 0.08	_	0.01 ± 0.08	0.00 ± 0.00		
Employee Health	0	(0.0)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	_		
Handwashing & Handwash Sinks	10	(5.7)	0.02 ± 14	_	0.02 ± 0.14	0.00 ± 0.00		
Personal Cleanliness & Grooming	0	(0.0)	0.00 ± 0.00	_	_	0.00 ± 0.00		
Approved Food Sources Protecting Food from	1	(0.6)	0.00 ± 0.05	_	0.00 ± 0.05	-		
Contamination	15	(8.5)	0.03 ± 0.17	—	0.01 ± 0.09	0.02 ± 0.15		
Cooling	3	(1.7)	0.01 ± 0.08	_	0.01 ± 0.08	0.00 ± 0.00		
Reheating	1	(0.6)	0.00 ± 0.05	_	0.00 ± 0.05	_		
Cooking	0	(0.0)	0.00 ± 0.00	_	0.00 ± 0.00	_		
Thawing	26	(14.8)	0.00 ± 0.00	_	_	0.00 ± 0.00		
Time & Temperature Control Adequate Equipment for Cold/Hot	26	(14.8)	0.05 ± 0.26	-	0.05 ± 0.26	0.00 ± 0.00		
Holding	0	(0.0)	—	0.00 ± 0.00	_	0.00 ± 0.00		
Date-marking & Labeling	19	(10.8)	0.04 ± 0.20	_	0.04 ± 0.20	0.00 ± 0.00		
Use of Thermometers & Test Kits Use of Single-use Gloves &	0	(0.0)	_	0.00 ± 0.00	-	0.00 ± 0.00		
Utensils/Bare Hand Contact	0	(0.0)	0.00 ± 0.00	-	0.00 ± 0.00	0.00 ± 0.00		
Use of Utensils & Linens	4	(2.3)	0.01 ± 0.08	0.00 ± 0.05	0.00 ± 0.05	0.01 ± 0.08		
Wiping Clothes	0	(0.0)	0.00 ± 0.00	_	_	0.00 ± 0.00		
Food Contact Surfaces	18	(10.2)	0.03 ± 0.17	0.01 ± 0.09	0.04 ± 0.19	0.00 ± 0.00		
Non-food Contact Surfaces	1	(0.6)	0.00 ± 0.05	_	_	0.00 ± 0.05		
Ware Washing	17	(9.7)	0.04 ± 0.19	_	0.01 ± 0.12	0.02 ± 0.14		

Mean Number of Food Code Violations in 31 Categories by State: Idaho (n = 481)

	No. of Violations		Mean nun	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in Each Category(%) ^a		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Water & Ice Supply	1	(0.6)	0.00 ± 0.00	0.00 ± 0.05	0.00 ± 0.00	0.00 ± 0.05		
Waste Water & Sewage Plumbing & Adequate Toilet	5	(2.8)	-	0.01 ± 0.15	0.01 ± 0.15	_		
Facilities	4	(2.3)	_	0.01 ± 0.09	0.00 ± 0.00	0.01 ± 0.09		
Toilets Premises & Equipment	0	(0.0)	_	0.00 ± 0.00	_	0.00 ± 0.00		
Maintenance	1	(0.6)	_	0.00 ± 0.05	_	0.00 ± 0.05		
Lighting & Ventilation Garbage & Recycling Facilities	1	(0.6)	_	0.00 ± 0.05	-	0.00 ± 0.05		
Outside	0	(0.0)	_	0.00 ± 0.00	_	0.00 ± 0.00		
Pest & Animal Controls Storage of Toxic Items & Personal	1	(0.6)	0.00 ± 0.00	0.00 ± 0.05	0.00 ± 0.00	0.00 ± 0.05		
Items Display of Valid Permit &	19	(10.8)	0.04 ± 0.20	_	0.04 ± 0.20	0.00 ± 0.00		
Consumer Advisories	0	(0.0)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00		
Other	0	(0.0)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00		
Total Violations	176							

Mean Number of Food Code Violations in 31 Categories by State: Idaho (n = 481)

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

Mean Number of Food Code Violations in 31 Categories by State: Kentucky (n = 1,184)									
	No. of Violations	Mean nun	facility ± Standard	Deviation					
Violation Categories	in Each Category(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations				
Person in Change	1 (0.1)	0.00 ± 0.03	_	0.00 ± 0.03	_				
Employee Health	5 (0.4)	0.00 ± 0.07	_	0.00 ± 0.07	_				
Handwashing & Handwash Sinks	20 (1.5)	0.02 ± 0.13	-	0.02 ± 0.13	_				
Personal Cleanliness & Grooming	25 (1.9)	0.02 ± 0.14	-	_	0.02 ± 0.14				
Approved Food Sources Protecting Food from	34 (2.6)	0.03 ± 0.17	_	0.03 ± 0.17	_				
Contamination	116 (8.8)	0.10 ± 0.31	-	0.00 ± 0.03	0.10 ± 0.31				
Cooling	_	_	—	_	_				
Reheating	_	_	—	_	_				
Cooking	_	_	_	_	_				
Thawing	5 (0.4)	0.00 ± 0.07	_	_	0.00 ± 0.07				
Time & Temperature Control Adequate Equipment for Cold/Hot	16 (1.2)	0.01 ± 0.12	_	0.01 ± 0.12	-				
Holding	27 (2.0)	0.02 ± 0.15	-	_	0.02 ± 0.15				
Date-marking & Labeling	26 (2.0)	0.02 ± 0.15	—	_	0.02 ± 0.15				
Use of Thermometers & Test Kits Use of Single-use Gloves &	21 (1.6)	0.02 ± 0.13	_	_	0.02 ± 0.13				
Utensils/Bare Hand Contact	_	_	_	_	_				
Use of Utensils & Linens	183 (13.9)	0.15 ± 0.39	—	_	0.15 ± 0.39				
Wiping Clothes	51 (3.9)	0.04 ± 0.20	_	_	0.04 ± 0.20				
Food Contact Surfaces ^b	7 (0.5)	0.01 ± 0.08	0.01 ± 0.08	0.01 ± 0.08	_				
Non-food Contact Surfaces ^b	128 (9.7)	0.11 ± 0.31	0.11 ± 0.31	_	0.11 ± 0.31				
Ware Washing ^b	96 (7.3)	0.08 ± 0.29	0.05 ± 0.23	0.03 ± 0.16	0.05 ± 0.23				

Mean Number of Food Code Violations in 31 Categories by State: Kentucky (n = 1,184)								
	No. of V	iolations	Mean nur	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in Each Category(%) ^a		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Water & Ice Supply	12	(0.9)	_	0.01 ± 0.10	0.01 ± 0.10	_		
Waste Water & Sewage Plumbing & Adequate Toilet	6	(0.5)	_	0.01 ± 0.07	0.01 ± 0.07	_		
Facilities	70	(5.3)	_	0.06 ± 0.24	0.00 ± 0.00	0.06 ± 0.24		
Toilets ^b Premises & Equipment	46	(3.5)	0.04 ± 0.19	0.04 ± 0.19	_	0.04 ± 0.19		
Maintenance ^b	286	(21.7)	0.24 ± 0.52	0.23 ± 0.50	_	0.26 ± 0.55		
Lighting & Ventilation Garbage & Recycling Facilities	56	(4.2)	_	0.05 ± 0.21	_	0.05 ± 0.21		
Outside	55	(4.2)	_	0.05 ± 0.21	_	0.05 ± 0.231		
Pest & Animal Controls ^b Storage of Toxic Items & Personal	6	(0.5)	0.01 ± 0.07	0.01 ± 0.07	0.01 ± 0.07	_		
Items Display of Valid Permit &	19	(1.4)	0.02 ± 0.13	_	0.02 ± 0.13	_		
Consumer Advisories	0	(0.0)	0.00 ± 0.00	—	0.00 ± 0.00	_		
Other	3	(0.2)	0.00 ± 0.05	_	_	0.00 ± 0.05		
Total Violations	1,320							

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.
^b These violation categories included food code violations with both behavioral and non-behavioral components, and researchers were not able to discern which from the health inspection data.

Number of Food Code Violations in 31 Categories by State: Louisiana ($n = 1,459$)									
	No. of Vi	olations	facility ± Standard	Deviation					
	in Each		Behavioral	Non-behavioral	Behavioral	Non-critical			
Violation Categories	Catego	ry(%) ^a	Violations	Violations	Violations	Violations			
Person in Change	-	-	_	-	_	_			
Employee Health	0	(0.0)	0.00 ± 0.00	_	_	_			
Handwashing & Handwash Sinks ^b	158	(3.8)	0.11 ± 0.37	_	_	_			
Personal Cleanliness & Grooming	25	(0.6)	0.02 ± 0.14	_	_	_			
Approved Food Sources	15	(0.4)	0.01 ± 0.10	_	_	_			
Protecting Food from Contamination	298	(7.2)	0.20 ± 0.51	_	_	_			
Cooling	3	(0.1)	0.00 ± 0.05	_	_	_			
Reheating	1	(0.0)	0.00 ± 0.03	_	_	_			
Cooking	0	(0.0)	0.00 ± 0.00	_	_	_			
Thawing	16	(0.4)	0.01 ± 0.10	_	_	_			
Time & Temperature Control Adequate Equipment for Cold/Hot	45	(1.1)	0.03 ± 0.18	_	_	_			
Holding	14	(0.3)	_	0.01 ± 0.10	_	_			
Date-marking & Labeling	92	(2.2)	0.06 ± 0.25	0.00 ± 0.00	_	_			
Use of Thermometers & Test Kits Use of Single-use Gloves &	59	(1.4)	0.04 ± 0.20	0.00 ± 0.00	_	_			
Utensils/Bare Hand Contact	13	(0.3)	0.01 ± 0.09	0.00 ± 0.00	_	_			
Use of Utensils & Linens	264	(6.4)	0.18 ± 0.40	0.00 ± 0.00	_	_			
Wiping Clothes	57	(1.4)	0.04 ± 0.19	0.00 ± 0.00	_	_			
Food Contact Surfaces	210	(5.1)	0.14 ± 0.40	0.00 ± 0.00	_	_			
Non-food Contact Surfaces	80	(1.9)	_	0.05 ± 0.23	_	_			

	No. of V	iolations	Mean nur	Mean number of violations per facility ± Standard Deviation				
Violation Categories Ware Washing	in Each Category(%)ª		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
	406	(9.8)	0.26 ± 0.56	0.02 ± 0.13	_	_		
Water & Ice Supply	47	(1.1)	0.01 ± 0.10	0.02 ± 0.15	_	_		
Waste Water & Sewage Plumbing & Adequate Toilet	54 406	(1.3)	-	0.04 ± 0.19	_	_		
Toilets Premises & Equipment	400	(9.8)	0.07 ± 0.01 0.00 ± 0.00	0.21 ± 0.48 0.00 ± 0.00	_	_		
Maintenance ^b	1113	(26.8)	0.68 ± 0.89	0.76 ± 1.01	_	_		
Lighting & Ventilation Garbage & Recycling Facilities	301	(7.3)	0.01 ± 0.11	0.19 ± 0.44	_	_		
Outside	221	(5.3)	0.03 ± 0.31	0.12 ± 0.38	—	—		
Pest & Animal Controls Storage of Toxic Items & Personal	77	(1.9)	0.00 ± 0.06	0.05 ± 0.23	_	_		
Items Display of Valid Permit &	146	(3.5)	0.10 ± 0.35	_	_	_		
Consumer Advisories	23	(0.6)	0.02 ± 0.13	0.00 ± 0.00	_	_		
Other	2	(0.0)	0.00 ± 0.04	0.00 ± 0.00	_	_		
Total Violations	4,146							

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.
^b These violation categories included food code violations with both behavioral and non-behavioral components, and researchers were not able to discern

which from the health inspection data.

	No. of Vi	olations	Mean num	Mean number of violations per facility ± Standard Deviation			
Violation Categories	in Ea Categor	ach ry(%)ª	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Person in Change	9	(0.5)	0.01 ± 0.09	_	_	0.01 ± 0.09	
Employee Health	0	(0.0)	0.00 ± 0.00	_	0.00 ± 0.00	_	
Handwashing & Handwash Sinks	47	(2.7)	0.05 ± 0.22	_	0.00 ± 0.06	0.04 ± 0.21	
Personal Cleanliness & Grooming	16	(0.9)	0.02 ± 0.12	_	_	0.02 ± 0.12	
Approved Food Sources Protecting Food from	1	(0.1)	0.00 ± 0.03	_	0.00 ± 0.03	_	
Contamination	93	(5.3)	0.09 ± 0.31	_	0.02 ± 0.13	0.08 ± 0.28	
Cooling	4	(0.2)	0.00 ± 0.06	_	0.00 ± 0.00	0.00 ± 0.06	
Reheating	2	(0.1)	0.00 ± 0.04	_	0.00 ± 0.04	_	
Cooking	2	(0.1)	0.00 ± 0.04	_	0.00 ± 0.04	_	
Thawing	7	(0.4)	0.01 ± 0.08	_	_	0.01 ± 0.08	
Time & Temperature Control Adequate Equipment for Cold/Hot Holding	40	(2.3)	0.04 ± 0.20	_	0.04 ± 0.20	0.00 ± 0.00	
Data marking & Laboling		(1.2)	$-$ 0.02 \pm 0.15	—	—	- 0.02 + 0.15	
Use of Thermometers & Test Kits ^b Use of Single-use Gloves &	58	(1.3)	0.02 ± 0.13 0.06 ± 0.23	0.06 ± 0.23	_	0.02 ± 0.13 0.06 ± 0.23	
Utensils/Bare Hand Contact	26	(1.5)	_	0.03 ± 0.16	_	0.03 ± 0.16	
Use of Utensils & Linens	3	(0.2)	0.00 ± 0.05	_	_	0.00 ± 0.05	
Wiping Clothes	36	(2.1)	0.04 ± 0.19	_	_	0.04 ± 0.19	
Food Contact Surfaces	156	(8.9)	_	0.15 ± 0.46	_	0.15 ± 0.46	
Non-food Contact Surfaces	_		_	_	_	_	
Ware Washing ^b	63	(3.6)	0.06 ± 0.25	0.06 ± 0.25	_	0.06 ± 0.25	

Mean Number of Food Code Violations in 31 Categories by State: Maryland (n = 1,018)

	No. of Violations		Mean num	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in H Catego	Each ory(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Water & Ice Supply	12	(0.7)	_	0.01 ± 0.11	0.01 ± 0.11	_		
Waste Water & Sewage Plumbing & Adequate Toilet	1	(0.1)	-	0.00 ± 0.03	0.00 ± 0.03	_		
Facilities	93	(5.3)	_	0.09 ± 0.31	_	0.09 ± 0.31		
Toilets ^b Premises & Equipment	46	(2.6)	0.05 ± 0.22	0.05 ± 0.22	_	0.05 ± 0.22		
Maintenance	535	(30.7)	0.53 ± 1.12	0.53 ± 1.12	_	0.53 ± 1.12		
Lighting & Ventilation Garbage & Recycling Facilities	182	(10.4)	_	0.18 ± 0.41	_	0.18 ± 0.41		
Outside ^b	74	(4.2)	0.07 ± 0.26	0.07 ± 0.26	_	0.07 ± 0.26		
Pest & Animal Controls Storage of Toxic Items & Personal	85	(4.9)	_	0.08 ± 0.30	_	0.08 ± 0.30		
Items Display of Valid Permit &	18	(1.0)	0.02 ± 0.13	-	_	0.02 ± 0.13		
Consumer Advisories	110	(6.3)	_	0.11 ± 0.34	_	0.11 ± 0.34		
Other ^b	3	(0.2)	0.00 ± 0.05	0.00 ± 0.05	_	0.00 ± 0.05		
Total Violations	1,744							

Mean Number of Food Code Violations in 31 Categories by State: Maryland (n = 1,018)

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

^b These violation categories included food code violations with both behavioral and non-behavioral components, and researchers were not able to discern which from the health inspection data.

Mean Number of Food Code violations in 31 Categories by State: Michigan ($n = 3,168$)									
	No. of Vi	iolations	Mean num	Mean number of violations per facility ± Standard Deviation					
Violation Categories	in E Catego	ach ry(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations			
Person in Change	109	(2.6)	0.03 ± 0.19	_	_	0.03 ± 0.19			
Employee Health	15	(0.4)	0.00 ± 0.07	_	0.00 ± 0.07	0.00 ± 0.00			
Handwashing & Handwash Sinks	207	(4.9)	0.06 ± 0.25	0.01 ± 0.09	0.01 ± 0.11	0.05 ± 0.24			
Personal Cleanliness & Grooming	69	(1.6)	0.02 ± 0.15	_	_	0.02 ± 0.15			
Approved Food Sources Protecting Food from	102	(2.4)	0.03 ± 0.19	-	0.01 ± 0.11	0.02 ± 0.15			
Contamination	263	(6.3)	0.08 ± 0.30	_	0.05 ± 0.22	0.03 ± 0.19			
Cooling	47	(1.1)	0.01 ± 0.13	_	0.00 ± 0.05	0.01 ± 0.11			
Reheating	5	(0.1)	0.00 ± 0.05	_	0.00 ± 0.05	_			
Cooking	1	(0.0)	0.00 ± 0.02	_	0.00 ± 0.02	0.00 ± 0.00			
Thawing	13	(0.3)	0.00 ± 0.06	_	_	0.00 ± 0.06			
Time & Temperature Control Adequate Equipment for Cold/Hot	288	(6.9)	0.09 ± 0.32	_	0.09 ± 0.32	_			
Holding	7	(0.2)	_	0.00 ± 0.05	_	0.00 ± 0.05			
Date-marking & Labeling	132	(3.2)	0.05 ± 0.31	_	_	0.05 ± 0.31			
Use of Thermometers & Test Kits Use of Single-use Gloves &	235	(5.6)	0.02 ± 0.13	0.06 ± 0.25	_	0.07 ± 0.29			
Utensils/Bare Hand Contact	42	(1.0)	0.01 ± 0.11	0.00 ± 0.03	0.00 ± 0.05	0.01 ± 0.11			
Use of Utensils & Linens	115	(2.7)	0.03 ± 0.18	0.00 ± 0.06	_	0.04 ± 0.19			
Wiping Clothes	114	(2.)	0.04 ± 0.19	_	_	0.04 ± 0.19			
Food Contact Surfaces	230	(5.5)	0.06 ± 0.33	0.01 ± 0.13	0.05 ± 0.31	0.02 ± 0.15			
Non-food Contact Surfaces	268	(6.4)	0.07 ± 0.26	0.02 ± 0.16	_	0.08 ± 0.30			
Ware Washing	137	(3.3)	0.04 ± 0.21	0.00 ± 0.06	0.02 ± 0.15	0.02 ± 0.15			

Mean Number of Food Code violations in 51 Categories by State: Michigan ($n = 3,168$)									
	No. of V	iolations	Mean nun	Mean number of violations per facility ± Standard Deviation					
Violation Categories	in Each Category(%)ª		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations			
Water & Ice Supply	3	(0.1)	0.00 ± 0.00	0.00 ± 0.03	0.00 ± 0.00	0.00 ± 0.03			
Waste Water & Sewage Plumbing & Adequate Toilet	105	(2.5)	0.00 ± 0.00	0.03 ± 0.19	0.01 ± 0.11	0.02 ± 0.15			
Facilities	352	(8.4)	0.08 ± 0.32	0.03 ± 0.17	0.06 ± 0.26	0.05 ± 0.26			
Toilets Premises & Equipment	16	(0.4)	_	0.01 ± 0.07	-	0.01 ± 0.07			
Maintenance	801	(19.1)	0.10 ± 0.36	0.15 ± 0.43	—	0.25 ± 0.60			
Lighting & Ventilation Garbage & Recycling Facilities	168	(4.0)	_	0.05 ± 0.24	-	0.05 ± 0.24			
Outside	100	(2.4)	0.00 ± 0.00	0.03 ± 0.19	_	0.03 ± 0.19			
Pest & Animal Controls Storage of Toxic Items & Personal	223	(5.3)	0.00 ± 0.07	0.01 ± 0.13	-	0.02 ± 0.15			
Items Display of Valid Permit &	3	(0.1)	0.06 ± 0.24	-	0.04 ± 0.20	0.02 ± 0.13			
Consumer Advisories	3	(0.1)	0.00 ± 0.03	_	_	0.00 ± 0.03			
Other	13	(0.3)		0.00 ± 0.06	0.00 ± 0.00	0.00 ± 0.06			
Total Violations	4,186								

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

	No. of V	iolations	Mean number of violations per facility ± Standard Deviation			
Violation Categories	in F Catego	Each ory(%)ª	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations
Person in Change	17	(0.7)	0.01 ± 0.10	_	0.01 ± 0.07	0.00 ± 0.07
Employee Health	4	(0.2)	0.00 ± 0.02	_	0.00 ± 0.02	0.00 ± 0.00
Handwashing & Handwash Sinks	45	(1.8)	0.02 ± 0.15	0.01 ± 0.08	0.01 ± 0.08	0.02 ± 0.14
Personal Cleanliness & Grooming	15	(0.6)	0.01 ± 0.10	_	0.00 ± 0.00	0.01 ± 0.10
Approved Food Sources Protecting Food from	9	(0.4)	0.01 ± 0.07	_	0.01 ± 0.07	-
Contamination	256	(10.5)	0.15 ± 0.45	0.00 ± 0.05	0.06 ± 0.28	0.09 ± 0.33
Cooling	18	(0.7)	0.01 ± 0.12	_	0.00 ± 0.06	0.01 ± 0.09
Reheating	2	(0.1)	0.00 ± 0.03	_	0.00 ± 0.03	0.00 ± 0.00
Cooking	4	(0.2)	0.00 ± 0.05	_	0.00 ± 0.05	0.00 ± 0.00
Thawing	12	(0.5)	0.01 ± 0.08	_	0.00 ± 0.00	0.01 ± 0.08
Time & Temperature Control Adequate Equipment for Cold/Hot	99	(4.1)	0.06 ± 0.27	_	0.05 ± 0.26	0.00 ± 0.08
Holding	11	(0.5)	0.00 ± 0.00	0.01 ± 0.08	_	0.01 ± 0.08
Date-marking & Labeling	67	(2.8)	0.04 ± 0.21	_	0.03 ± 0.17	0.01 ± 0.11
Use of Thermometers & Test Kits Use of Single-use Gloves &	136	(5.6)	0.15	0.03 ± 0.18	-	0.05 ± 0.24
Utensils/Bare Hand Contact	8	(0.3)	0.00 ± 0.07	_	0.00 ± 0.04	0.00 ± 0.05
Use of Utensils & Linens	105	(4.3)	0.06 ± 0.27	_	_	0.06 ± 0.27
Wiping Clothes	45	(1.8)	0.03 ± 0.16	_	0.00 ± 0.00	0.03 ± 0.16
Food Contact Surfaces	103	(4.2)	0.04 ± 0.22	0.03 ± 0.17	0.05 ± 0.24	0.01 ± 0.14
Non-food Contact Surfaces	358	(14.7)	0.17 ± 0.53	0.04 ± 0.23	0.11 ± 0.39	0.01 ± 0.40
Ware Washing	96	(3.9)	0.03 ± 0.18	0.03 ± 0.17	0.03 ± 0.17	0.03 ± 0.18

Mean Number of Food Code Violations in 31 Categories by State: Missouri (n = 1,689)

	No. of Violations		Mean nun	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in Each Category(%)ª		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Water & Ice Supply	5	(0.2)	0.00 ± 0.00	0.00 ± 0.05	0.00 ± 0.04	0.00 ± 0.03		
Waste Water & Sewage Plumbing & Adequate Toilet	20	(0.8)	_	0.01 ± 0.11	0.01 ± 0.08	0.01 ± 0.07		
Facilities	95	(3.9)	0.04 ± 0.20	0.01 ± 0.13	0.04 ± 0.19	0.02 ± 0.15		
Toilets Premises & Equipment	24	(1.0)	0.00 ± 0.04	0.01 ± 0.11	_	0.01 ± 0.12		
Maintenance	446	(18.3)	0.20 ± 0.52	0.07 ± 0.28	0.00 ± 0.03	0.27 ± 0.60		
Lighting & Ventilation Garbage & Recycling Facilities	88	(3.6)	_	0.05 ± 0.24	_	0.05 ± 0.24		
Outside	87	(3.6)	0.02 ± 0.17	0.03 ± 0.17	_	0.05 ± 0.27		
Pest & Animal Controls Storage of Toxic Items & Personal	58	(2.4)	0.03 ± 0.20	0.00 ± 0.03	0.03 ± 0.18	0.00 ± 0.08		
Items	93	(3.8)	0.06 ± 0.26	_	0.06 ± 0.26	_		
Display of Valid Permit &								
Consumer Advisories	8	(0.3)	0.00 ± 0.02	0.00 ± 0.07	0.00 ± 0.02	0.00 ± 0.07		
Other	100	(4.1)	0.00 ± 0.00	0.06 ± 0.26	0.00 ± 0.00	0.06 ± 0.26		
Total Violations	2,434							

Mean Number of Food Code Violations in 31 Categories by State: Missouri (n = 1,689)

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

	No. of Violations in Each Category(%) ^a		Mean nun	Mean number of violations per facility \pm Standard Deviation				
Violation Categories			Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Person in Change	2	(0.5)	0.01 ± 0.07	_	0.01 ± 0.07	0.00 ± 0.00		
Employee Health	0	(0.0)	0.00 ± 0.00	_	0.00 ± 0.00	0.00 ± 0.00		
Handwashing & Handwash Sinks	13	(3.3)	0.03 ± 0.17	0.01 ± 0.07	0.01 ± 0.09	0.03 ± 0.16		
Personal Cleanliness & Grooming	13	(3.3)	0.04 ± 0.20	_	0.02 ± 0.15	0.01 ± 0.12		
Approved Food Sources Protecting Food from	6	(1.5)	0.02 ± 0.13	_	0.02 ± 0.13	0.00 ± 0.00		
Contamination	60	(15.3)	0.16 ± 0.40	0.00 ± 0.00	0.08 ± 0.27	0.08 ± 0.30		
Cooling	1	(0.3)	0.00 ± 0.05	_	0.00 ± 0.00	0.00 ± 0.05		
Reheating	0	(0.0)	0.00 ± 0.00	_	0.00 ± 0.00	_		
Cooking	0	(0.0)	0.00 ± 0.00	_	0.00 ± 0.00	0.00 ± 0.00		
Thawing	6	(1.5)	0.02 ± 0.13	_	_	0.02 ± 0.13		
Time & Temperature Control Adequate Equipment for Cold/Hot	24	(6.1)	0.07 ± 0.27	-	0.07 ± 0.27	0.00 ± 0.00		
Holding	1	(0.3)	0.00 ± 0.05	_	_	0.00 ± 0.05		
Date-marking & Labeling	23	(5.9)	0.06 ± 0.24	_	0.04 ± 0.19	0.03 ± 0.16		
Use of Thermometers & Test Kits Use of Single-use Gloves &	20	(5.1)	0.04 ± 0.20	0.01 ± 0.10	0.04 ± 0.20	0.01 ± 0.10		
Utensils/Bare Hand Contact	2	(0.5)	0.01 ± 0.07	-	0.00 ± 0.05	0.00 ± 0.05		
Use of Utensils & Linens	10	(2.5)	0.03 ± 0.16	_	_	0.03 ± 0.16		
Wiping Clothes	18	(4.6)	0.05 ± 0.22	_	_	0.05 ± 0.22		
Food Contact Surfaces	16	(4.1)	0.00 ± 0.05	0.04 ± 0.20	0.02 ± 0.14	0.02 ± 0.15		
Non-food Contact Surfaces	23	(5.9)	0.06 ± 0.24	_	_	0.06 ± 0.24		
Ware Washing	63	(16.0)	0.17 ± 0.44	_	0.10 ± 0.34	0.07 ± 0.26		

Mean Number of Food Code Violations in 31 Categories by State: North Dakota (n = 369)

	No. of Violations		Mean number of violations per facility ± Standard Deviation				
Violation Categories	in Each Category(%) ^a		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Water & Ice Supply	2	(0.5)	0.00 ± 0.00	0.01 ± 0.07	0.00 ± 0.05	0.00 ± 0.05	
Waste Water & Sewage Plumbing & Adequate Toilet	1	(0.3)	0.00 ± 0.00	0.00 ± 0.05	0.00 ± 0.05	0.00 ± 0.00	
Facilities	5	(1.3)	0.00 ± 0.00	0.01 ± 0.12	0.01 ± 0.12	0.00 ± 0.00	
Toilets	10	(2.5)	_	0.03 ± 0.16	_	0.03 ± 0.16	
Premises & Equipment Maintenance	38	(9.7)	0.02 ± 0.14	0.08 ± 0.29	_	0.10 ± 0.31	
Lighting & Ventilation Garbage & Recycling Facilities	9	(2.3)	0.01 ± 0.07	0.02 ± 0.14	_	0.02 ± 0.15	
Outside	7	(1.8)	0.00 ± 0.00	0.02 ± 0.14	_	0.02 ± 0.14	
Pest & Animal Controls Storage of Toxic Items & Personal	1	(0.3)	0.00 ± 0.05	_	0.00 ± 0.00	0.00 ± 0.05	
Items	19	(4.8)	0.05 ± 0.22	_	0.05 ± 0.22	_	
Display of Valid Permit &							
Consumer Advisories	0	(0.0)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	
Other	0	(0.0)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	
Total Violations	393						

Mean Number of Food Code Violations in 31 Categories by State: North Dakota (n = 369)

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.
Mean Number of Food Code Violations in 31 Categories by State: New Hampshire $(n = 455)$									
	No. of Violations	Mean nur	facility ± Standard	Deviation					
	in Each	Behavioral	Non-behavioral	Behavioral	Non-critical				
Violation Categories	Category(%) ^a	Violations	Violations	Violations	Violations				
Person in Change	-	_	-	_	_				
Employee Health	10 (1.5)	0.02 ± 0.15	-	0.02 ± 0.15	_				
Handwashing & Handwash Sinks	10 (1.5)	0.02 ± 0.15	_	0.00 ± 0.00	_				
Personal Cleanliness & Grooming	4 (0.6)	0.01 ± 0.09	_	0.01 ± 0.09	0.00 ± 0.00				
Approved Food Sources Protecting Food from	12 (1.8)	0.03 ± 0.16	_	0.03 ± 0.16	_				
Contamination	70 (10.5)	0.15 ± 0.37	-	0.03 ± 0.16	0.13 ± 0.33				
Cooling	_	—	_	_	_				
Reheating	_	—	_	_	_				
Cooking	_	_	_	_	_				
Thawing	3 (0.5)	0.01 ± 0.08	_	_	0.01 ± 0.08				
Time & Temperature Control Adequate Equipment for Cold/Hot	35 (5.3)	0.08 ± 0.27	-	0.08 ± 0.27	_				
Holding	1 (0.2)	—	0.00 ± 0.05	0.00 ± 0.05	_				
Date-marking & Labeling	5 (0.8)	0.01 ± 0.10	_	_	0.01 ± 0.10				
Use of Thermometers & Test Kits Use of Single-use Gloves &	30 (4.5)	_	0.07 ± 0.26	-	0.07 ± 0.26				
Utensils/Bare Hand Contact	27 (4.1)	0.06 ± 0.24	_	_	0.06 ± 0.24				
Use of Utensils & Linens	21 (3.2)	0.05 ± 0.21	_	_	0.05 ± 0.21				
Wiping Clothes	_	_	_	_	_				
Food Contact Surfaces	77 (11.6)	0.11 ± 0.31	0.06 ± 0.25	_	0.17 ± 0.39				
Non-food Contact Surfaces	66 (9.9)	0.08 ± 0.27	0.07 ± 0.26	_	0.15 ± 0.41				
Ware Washing	41 (6.2)	0.09 ± 0.30	0.13 ± 0.34	0.08 ± 0.27	0.14 ± 0.35				

Mean Number of Food Code Violations in 31 Categories by State: New Hampshire (n = 455)								
	No. of V	iolations	Mean nur	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in Each Category(%)ª		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Water & Ice Supply	0	(0.0)	_	0.00 ± 0.00	0.00 ± 0.00	_		
Waste Water & Sewage Plumbing & Adequate Toilet	19	(2.9)	_	0.04 ± 0.20	0.01 ± 0.20	-		
Facilities	43	(6.5)	_	0.09 ± 0.30	0.03 ± 0.17	0.06 ± 0.25		
Toilets ^b Premises & Equipment	27	(4.1)	0.06 ± 0.24	0.06 ± 0.24	_	0.06 ± 0.24		
Maintenance ^b	66	(9.9)	0.15 ± 0.38	0.13 ± 0.36	_	0.15 ± 0.38		
Lighting & Ventilation Garbage & Recycling Facilities	19	(2.9)	_	0.04 ± 0.20	_	0.04 ± 0.20		
Outside ^b	21	(3.2)	0.01 ± 0.10	0.05 ± 0.23	_	0.05 ± 0.23		
Pest & Animal Controls ^b Storage of Toxic Items & Personal	28	(4.2)	0.06 ± 0.24	0.06 ± 0.24	0.06 ± 0.24	_		
Items Display of Valid Permit &	25	(3.8)	0.05 ± 0.23	-	0.05 ± 0.23	_		
Consumer Advisories	-	-	_	—	_	_		
Other	6	(0.9)	0.00 ± 0.07	0.01 ± 0.09	_	0.01 ± 0.11		
Total Violations	666							

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.
^b These violation categories included food code violations with both behavioral and non-behavioral components, and researchers were not able to discern which from the health inspection data.

	No. of V	iolations	Mean number of violations per facility \pm Standard Deviation				
Violation Categories	in E Catego	Cach ry(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Person in Change	0	(0.0)	0.00 ± 0.00	_	_	0.00 ± 0.00	
Employee Health	0	(0.0)	0.00 ± 0.00	_	0.00 ± 0.00	0.00 ± 0.00	
Handwashing & Handwash Sinks	27	(3.4)	0.00 ± 0.06	0.05 ± 0.24	0.05 ± 0.25	0.00 ± 0.00	
Personal Cleanliness & Grooming	27	(3.4)	0.05 ± 0.23	_	0.05 ± 0.23	_	
Approved Food Sources Protecting Food from	14	(1.8)	0.03 ± 0.17	0.00 ± 0.00	0.03 ± 0.17	_	
Contamination	80	(10.1)	0.16 ± 0.48	0.00 ± 0.00	0.10 ± 0.38	0.07 ± 0.27	
Cooling	1	(0.1)	0.00 ± 0.05	_	0.00 ± 0.05	_	
Reheating	1	(0.1)	0.00 ± 0.05	_	0.00 ± 0.05	_	
Cooking	1	(0.1)	0.00 ± 0.05	_	0.00 ± 0.05	_	
Thawing	8	(1.0)	0.02 ± 0.13	_	0.02 ± 0.13	_	
Time & Temperature Control Adequate Equipment for Cold/Hot	66	(8.3)	0.13 ± 0.35	_	0.12 ± 0.33	0.01 ± 0.10	
Holding	20	(2.5)	_	0.04 ± 0.20	0.04 ± 0.20	_	
Date-marking & Labeling	15	(1.9)	0.03 ± 0.20	_	0.02 ± 0.14	0.01 ± 0.12	
Use of Thermometers & Test Kits Use of Single-use Gloves &	41	(5.2)	_	0.08 ± 0.31	_	0.08 ± 0.31	
Utensils/Bare Hand Contact	18	(2.3)	0.04 ± 0.19	0.00 ± 0.00	0.03 ± 0.17	0.01 ± 0.08	
Use of Utensils & Linens	9	(1.1)	0.01 ± 0.11	0.01 ± 0.08	_	0.02 ± 0.13	
Wiping Clothes	20	(2.5)	_	0.04 ± 0.20	0.04 ± 0.20	_	
Food Contact Surfaces	12	(1.5)	0.02 ± 0.15	0.00 ± 0.00	0.00 ± 0.06	0.02 ± 0.14	
Non-food Contact Surfaces	49	(6.2)	0.05 ± 0.23	0.05 ± 0.22	_	0.10 ± 0.31	
Ware Washing	79	(9.9)	0.09 ± 0.29	0.07 ± 0.27	0.13 ± 0.40	0.03 ± 0.17	

Mean Number of Food Code Violations in 31 Categories by State: New Mexico (n = 492)

	No. of V	iolations	Mean nun	Mean number of violations per facility ± Standard Deviation			
Violation Categories	in H Catego	Each ory(%)ª	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Water & Ice Supply ^b	11	(1.4)	0.02 ± 0.13	0.02 ± 0.15	0.02 ± 0.15	0.00 ± 0.00	
Waste Water & Sewage Plumbing & Adequate Toilet	2	(0.3)	_	0.00 ± 0.06	0.00 ± 0.06	_	
Facilities	35	(4.4)	_	0.07 ± 0.29	0.04 ± 0.23	0.03 ± 0.17	
Toilets ^b Premises & Equipment	17	(2.1)	0.01 ± 0.10	0.02 ± 0.15	0.00 ± 0.05	0.03 ± 0.17	
Maintenance	170	(21.4)	0.17 ± 0.44	0.35 ± 0.68	0.00 ± 0.00	0.35 ± 0.69	
Lighting & Ventilation Garbage & Recycling Facilities	39	(4.9)	_	0.08 ± 0.29	_	0.08 ± 0.29	
Outside ^b	2	(0.3)	0.00 ± 0.06	0.00 ± 0.05	_	0.00 ± 0.06	
Pest & Animal Controls ^b Storage of Toxic Items & Personal	7	(0.9)	0.01 ± 0.12	0.01 ± 0.12	_	0.01 ± 0.12	
Items Display of Valid Permit &	14	(1.8)	0.03 ± 0.19	0.00 ± 0.00	0.02 ± 0.16	0.01 ± 0.09	
Consumer Advisories	10	(1.3)	0.01 ± 0.09	0.01 ± 0.11	0.00 ± 0.00	0.02 ± 0.14	
Other	0	(0.0)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	
Total Violations	795						

Mean Number of Food Code Violations in 31 Categories by State: New Mexico (n = 492)

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

	No. of Violations Mean nur			aber of violations per facility ± Standard Deviation			
Violation Categories	in Each Category(%) ^a		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Person in Change	-	_	_	_	_	_	
Employee Health	170	(1.3)	0.06 ± 0.39	_	0.06 ± 0.39	_	
Handwashing & Handwash Sinks ^b	495	(3.8)	0.17 ± 0.51	0.07 ± 0.26	0.09 ± 0.40	0.08 ± 0.31	
Personal Cleanliness & Grooming	39	(0.3)	0.01 ± 0.15	_	_	0.01 ± 0.15	
Approved Food Sources Protecting Food from	1,239	(9.6)	0.43 ± 1.04	_	0.43 ± 1.04	_	
Contamination	662	(5.1)	0.23 ± 0.53	_	0.09 ± 0.41	0.14 ± 0.36	
Cooling	14	(0.1)	0.00 ± 0.07	_	0.00 ± 0.07	_	
Reheating	6	(0.0)	0.00 ± 0.05	_	0.00 ± 0.05	_	
Cooking	31	(0.2)	0.01 ± 0.14	_	0.01 ± 0.14	_	
Thawing	19	(0.1)	0.01 ± 0.11	_	_	0.01 ± 0.11	
Time & Temperature Control Adequate Equipment for Cold/Hot	312	(2.4)	0.11 ± 0.35	_	0.11 ± 0.35	_	
Holding	118	(0.9)	0.04 ± 0.24	-	0.04 ± 0.24	-	
Date-marking & Labeling	67	(0.5)	0.02 ± 0.23	_	0.02 ± 0.23	—	
Use of Thermometers & Test Kits ^b Use of Single-use Gloves &	227	(1.8)	0.08 ± 0.29	0.06 ± 0.26	0.02 ± 0.14	0.06 ± 0.26	
Utensils/Bare Hand Contact	559	(4.3)	0.19 ± 0.58	-	0.12 ± 0.49	0.07 ± 0.29	
Use of Utensils & Linens	1,566	(12.1)	0.54 ± 1.08	_	_	0.54 ± 1.08	
Wiping Clothes	526	(4.1)	0.18 ± 0.60	_	_	0.18 ± 0.60	
Food Contact Surfaces	445	(3.4)	0.07 ± 0.29	0.08 ± 0.33	0.00 ± 0.02	0.15 ± 0.45	

Mean Number of Food Code Violations in 31 Categories by State: New York (n = 2,890)

	No. of V	iolations	Mean nur	Mean number of violations per facility ± Standard Deviation			
Violation Categories	in Each Category(%) ^a		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Non-food Contact Surfaces	553	(4.3)	0.07 ± 0.27	0.12 ± 0.33	_	0.19 ± 0.43	
Ware Washing ^b	179	(1.4)	0.06 ± 0.25	0.06 ± 0.25	_	0.06 ± 0.25	
Water & Ice Supply	40	(0.3)	0.01 ± 0.12	0.01 ± 0.10	0.01 ± 0.12	0.01 ± 0.10	
Waste Water & Sewage Plumbing & Adequate Toilet	370	(2.9)	_	0.13 ± 0.51	_	0.13 ± 0.51	
Facilities	288	(2.2)	_	0.01 ± 0.38	_	0.10 ± 0.38	
Toilets ^b Premises & Equipment	273	(2.1)	0.09 ± 0.42	0.09 ± 0.42	_	0.09 ± 0.42	
Maintenance ^b	946	(7.3)	0.33 ± 0.65	0.00 ± 0.08	_	0.33 ± 0.65	
Lighting & Ventilation ^b Garbage & Recycling Facilities	393	(3.0)	0.14 ± 0.36	0.14 ± 0.36	_	0.14 ± 0.36	
Outside ^b	624	(4.8)	0.21 ± 0.65	0.22 ± 0.66	_	0.22 ± 0.66	
Pest & Animal Controls ^b Storage of Toxic Items & Personal	2,180	(16.9)	0.52 ± 1.18	0.44 ± 1.07	_	0.75 ± 1.53	
Items Display of Valid Permit &	97	(0.8)	0.03 ± 0.20	_	0.03 ± 0.20	_	
Consumer Advisories	469	(3.8)	0.16 ± 0.59	_	_	0.16 ± 0.59	
Other	-	_	_	_	_	_	
Total Violations	12,907						

Mean Number of Food Code Violations in 31 Categories by State: New York (n = 2,890)

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

	No. of Violations	Mean nun	Mean number of violations per facility \pm Standard Deviation				
Violation Categories	in Each Category(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Person in Change	21 (0.9)	0.01 ± 0.10	_	_	_		
Employee Health	0 (0.0)	0.00 ± 0.00	_	_	_		
Handwashing & Handwash Sinks	27 (1.2)	0.01 ± 0.10	_	_	_		
Personal Cleanliness & Grooming	13 (0.6)	0.00 ± 0.07	_	_	_		
Approved Food Sources Protecting Food from	27 (1.2)	0.01 ± 0.10	-	_	_		
Contamination	209 (9.3)	0.07 ± 0.31	_	_	_		
Cooling	—	_	_	_	_		
Reheating	_	_	_	_	_		
Cooking	2 (0.1)	0.00 ± 0.03		_	_		
Thawing	_	_	_	_	_		
Time & Temperature Control Adequate Equipment for Cold/Hot	220 (9.7)	0.08 ± 0.31	_	_	-		
Holding	86 (3.8)	_	0.03 ± 0.18	_	_		
Date-marking & Labeling	16 (0.7)	0.01 ± 0.08	_	_	_		
Use of Thermometers & Test Kits Use of Single-use Gloves &	_	_	_	_	_		
Utensils/Bare Hand Contact	—	_	—	—	_		
Use of Utensils & Linens	249 (11.0)	0.05 ± 0.24	_	_	_		
Wiping Clothes	_	_	_	_	_		
Food Contact Surfaces	181 (8.0)	0.06 ± 0.27		_	_		
Non-food Contact Surfaces	390 (17.3)	0.10 ± 0.32	0.04 ± 0.19	_	_		
Ware Washing	_	_	_	_	_		

Mean Number of Food Code Violations in 31 Categories by State: Ohio (n = 2,858)

	No. of Violations	No. of Violations Mean number of violations per facility ± Standard Deviation				
Violation Categories	in Each Category(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Water & Ice Supply	2 (0.1)	_	0.00 ± 0.03	_	_	
Waste Water & Sewage Plumbing & Adequate Toilet	9 (0.4)	_	0.00 ± 0.06	_	_	
Facilities	107 (4.7)	_	0.04 ± 0.20	—	_	
Toilets Premises & Equipment	_	_	_	_	-	
Maintenance	597 (26.4)	0.14 ± 0.43	0.07 ± 0.28	—	_	
Lighting & Ventilation Garbage & Recycling Facilities	_	_	_	_	_	
Outside ^b	35 (1.6)	0.01 ± 0.12	0.01 ± 0.12	—	—	
Pest & Animal Controls Storage of Toxic Items & Personal	_	_	_	_	_	
Items Display of Valid Permit &	56 (2.5)	0.02 ± 0.14	_	_	_	
Consumer Advisories	_	_	_	—	_	
Other	11 (0.5)	0.00 ± 0.03	0.00 ± 0.05	_	_	
Total Violations	2,258					

Mean Number of Food Code Violations in 31 Categories by State: Obio (n - 2.858)

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

	No. of V	iolations	Mean nun	nber of violations per	er facility ± Standard Deviation		
Violation Categories	in H Catego	Each ory(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Person in Change	24	(1.3)	0.02 ± 0.14	_	0.02 ± 0.14	_	
Employee Health	0	(0.0)	0.00 ± 0.00	_	0.00 ± 0.00	_	
Handwashing & Handwash Sinks ^b	69	(3.7)	0.06 ± 0.24	0.00 ± 0.00	0.06 ± 0.24	0.00 ± 0.00	
Personal Cleanliness & Grooming	29	(1.6)	0.02 ± 0.15	_	_	0.02 ± 0.15	
Approved Food Sources Protecting Food from	22	(1.2)	0.02 ± 0.13	_	0.02 ± 0.13	_	
Contamination	81	(4.4)	0.07 ± 0.27	_	0.05 ± 0.22	0.02 ± 0.13	
Cooling	2	(0.1)	0.00 ± 0.04	_	0.00 ± 0.04	_	
Reheating	4	(0.2)	0.00 ± 0.06	_	0.00 ± 0.06	_	
Cooking	1	(0.1)	0.00 ± 0.03	_	0.00 ± 0.03	_	
Thawing	13	(0.7)	0.01 ± 0.10	_	_	0.01 ± 0.10	
Time & Temperature Control Adequate Equipment for Cold/Hot	90	(4.8)	0.07 ± 0.29	-	0.07 ± 0.29	-	
Holding	33	(1.8)	_	0.03 ± 0.16	0.03 ± 0.16	_	
Date-marking & Labeling	59	(3.2)	0.05 ± 0.23	_	0.02 ± 0.13	0.03 ± 0.17	
Use of Thermometers & Test Kits Use of Single-use Gloves &	48	(2.6)	_	0.04 ± 0.19	_	0.04 ± 0.19	
Utensils/Bare Hand Contact	58	(3.1)	0.05 ± 0.21	_	_	0.05 ± 0.21	
Use of Utensils & Linens	75	(4.0)	0.06 ± 0.25	_	_	0.06 ± 0.25	
Wiping Clothes	48	(2.6)	0.04 ± 0.19	_	_	0.04 ± 0.19	
Food Contact Surfaces	119	(6.4)	0.10 ± 0.30	0.05 ± 0.21	0.10 ± 0.30	0.05 ± 0.21	
Non-food Contact Surfaces	188	(10.1)	0.15 ± 0.36	0.17 ± 0.38	_	0.33 ± 0.56	
Ware Washing	69	(3.7)	0.06 ± 0.24	0.03 ± 0.16	0.05 ± 0.22	0.03 ± 0.18	

Mean Number of Food Code Violations in 31 Categories by State: Oklahoma (n = 1,227)

	No. of V	iolations	Mean nun	Mean number of violations per facility ± Standard Deviation			
Violation Categories	in l Catego	Each ory(%)ª	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Water & Ice Supply	27	(1.5)	_	0.02 ± 0.15	0.02 ± 0.15	0.00 ± 0.00	
Waste Water & Sewage Plumbing & Adequate Toilet	_		_	_	_	_	
Facilities ^b	83	(4.5)	0.01 ± 0.09	0.06 ± 0.24	_	0.07 ± 0.26	
Toilets Premises & Equipment	38	(2.0)	_	0.03 ± 0.17	_	0.03 ± 0.17	
Maintenance	324	(17.4)	0.02 ± 0.16	0.24 ± 0.45	_	0.26 ± 0.48	
Lighting & Ventilation Garbage & Recycling Facilities	124	(6.7)	0.00 ± 0.00	0.10 ± 0.32	_	0.10 ± 0.32	
Outside ^b	29	(1.6)	0.02 ± 0.15	0.01 ± 0.06	_	0.03 ± 0.16	
Pest & Animal Controls Storage of Toxic Items & Personal	84	(4.5)	_	0.07 ± 0.25	0.07 ± 0.25	_	
Items Display of Valid Permit &	59	(3.2)	0.05 ± 0.21	_	0.05 ± 0.21	_	
Consumer Advisories	2	(0.1)	_	0.00 ± 0.04	0.00 ± 0.04	_	
Other ^b	60	(3.2)	0.05 ± 0.22	0.00 ± 0.00	_	0.05 ± 0.22	
Total Violations	1,862						

Mean Number of Food Code Violations in 31 Categories by State: Oklahoma (n = 1,227)

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

Mean Number of Food Code Violations in 31 Categories by State: Pennsylvania ($n = 1,011$)								
	No. of Vi	olations	Mean nun	er facility ± Standard Deviation				
Violation Catagories	in Es Catagor	ach	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
	Categor	(1 4)		VIOIATIONS		violations		
Person in Change	29	(1.4)	0.03 ± 0.17	—	0.03 ± 0.17	—		
Employee Health	5	(0.2)	0.00 ± 0.07	—	0.00 ± 0.07	-		
Handwashing & Handwash Sinks	23	(1.1)	0.02 ± 0.15	_	0.02 ± 0.15	0.00 ± 0.03		
Personal Cleanliness & Grooming	52	(2.5)	0.05 ± 0.24	_	0.02 ± 0.13	0.03 ± 0.18		
Approved Food Sources Protecting Food from	19	(0.9)	0.02 ± 0.14	_	0.02 ± 0.14	0.00 ± 0.00		
Contamination	128	(6.2)	0.12 ± 0.36	0.00 ± 0.06	0.02 ± 0.14	0.11 ± 0.34		
Cooling	34	(1.6)	0.03 ± 0.19	_	_	0.03 ± 0.19		
Reheating	0	(0.0)	0.00 ± 0.00	-	0.00 ± 0.00	_		
Cooking	0	(0.0)	0.00 ± 0.00	-	0.00 ± 0.00	0.00 ± 0.00		
Thawing	6	(0.3)	0.01 ± 0.08	-	_	0.01 ± 0.08		
Time & Temperature Control Adequate Equipment for Cold/Hot	71	(3.4)	0.07 ± 0.29	_	0.07 ± 0.29	_		
Holding	17	(0.8)	_	0.02 ± 0.13	_	0.02 ± 0.13		
Date-marking & Labeling	14	(0.7)	0.01 ± 0.13	0.00 ± 0.00	0.00 ± 0.00	0.01 ± 0.13		
Use of Thermometers & Test Kits Use of Single-use Gloves &	136	(6.6)	0.01 ± 0.11	0.12 ± 0.36	_	0.13 ± 0.38		
Utensils/Bare Hand Contact	76	(3.7)	0.08 ± 0.30	0.00 ± 0.00	_	0.08 ± 0.30		
Use of Utensils & Linens	91	(4.4)	0.09 ± 0.31	_	0.02 ± 0.13	0.07 ± 0.28		
Wiping Clothes	19	(0.9)	0.02 ± 0.14	0.00 ± 0.00	_	0.02 ± 0.14		
Food Contact Surfaces	83	(4.0)	0.02 ± 0.15	0.06 ± 0.27	_	0.08 ± 0.31		
Non-food Contact Surfaces	67	(3.3)	0.05 ± 0.22	0.02 ± 0.15	_	0.07 ± 0.27		
Ware Washing	161	(7.8)	0.10 ± 0.34	0.05 ± 0.24	0.03 ± 0.18	0.13 ± 0.36		

Mean Number of Food Code Violations in 31 Categories by State: Pennsylvania ($n = 1,011$)							
	No. of V	iolations	Mean number of violations per facility \pm Standard Deviation				
Violation Categories	in E Catego	Each ory(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Water & Ice Supply	35	(1.7)	0.00 ± 0.00	0.03 ± 0.19	0.00 ± 0.00	0.03 ± 0.19	
Waste Water & Sewage Plumbing & Adequate Toilet	27	(1.3)	_	0.03 ± 0.16	_	0.03 ± 0.16	
Facilities	181	(8.8)	_	0.18 ± 0.47	_	0.18 ± 0.47	
Toilets Premises & Equipment	0	(0.0)	-	0.00 ± 0.00	-	0.00 ± 0.00	
Maintenance	532	(25.8)	0.08 ± 0.29	0.45 ± 0.82	_	0.53 ± 0.87	
Lighting & Ventilation Garbage & Recycling Facilities	39	(1.9)	-	0.04 ± 0.41	-	0.04 ± 0.41	
Outside	148	(7.2)	0.01 ± 0.12	0.13 ± 0.45	_	0.15 ± 0.47	
Pest & Animal Controls Storage of Toxic Items & Personal	3	(0.1)	0.00 ± 0.05	_	_	0.00 ± 0.05	
Items Display of Valid Permit &	45	(2.2)	0.04 ± 0.24	_	0.04 ± 0.24	_	
Consumer Advisories	2	(0.1)	0.00 ± 0.04	—	0.00 ± 0.04	_	
Other	18	(0.9)	0.01 ± 0.08	0.01 ± 0.12	0.00 ± 0.06	0.01 ± 0.13	
Total Violations	2,061						

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

Mean Number of Food Code Violations in 31 Categories by State: Rhode Island (n = 273)							
	No. of Vi	Violations Mean number of violations per			r facility ± Standard Deviation		
Violation Categories	in E Catego	ach ry(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Person in Change	7	(0.9)	0.03 ± 0.16	_	0.03 ± 0.16	_	
Employee Health	1	(0.1)	0.00 ± 0.06	_	0.00 ± 0.06	_	
Handwashing & Handwash Sinks ^b	51	(6.6)	0.19 ± 0.46	0.15 ± 0.38	0.19 ± 0.46	0.00 ± 0.00	
Personal Cleanliness & Grooming	5	(0.6)	0.02 ± 0.13	_	0.00 ± 0.00	0.02 ± 0.13	
Approved Food Sources Protecting Food from	95	(12.3)	0.35 ± 0.49	_	0.00 ± 0.00	0.35 ± 0.49	
Contamination	39	(5.0)	0.14 ± 0.35	_	0.01 ± 0.10	0.13 ± 0.34	
Cooling	5	(0.6)	0.02 ± 0.20	_	0.02 ± 0.20	_	
Reheating	10	(1.3)	0.04 ± 0.19	_	0.04 ± 0.19	_	
Cooking	28	(3.6)	0.10 ± 0.32	_	0.00 ± 0.06	0.10 ± 0.31	
Thawing	38	(4.9)	0.14 ± 0.40	_	_	0.14 ± 0.40	
Time & Temperature Control Adequate Equipment for Cold/Hot Holding	30	(3.9)	0.11 ± 0.31	_	0.00 ± 0.06	0.11 ± 0.31	
Date-marking & Labeling	10	(1.3)	0.04 ± 0.19	_	0.04 ± 0.19	0.00 ± 0.00	
Use of Thermometers & Test Kits ^b Use of Single-use Gloves &	0	(0.0)	0.00 ± 0.00	0.00 ± 0.00	_	0.00 ± 0.00	
Utensils/Bare Hand Contact	0	(0.0)	0.00 ± 0.00	_	0.00 ± 0.00	0.00 ± 0.00	
Use of Utensils & Linens	3	(0.4)	0.01 ± 0.10	_	_	0.01 ± 0.10	
Wiping Clothes	0	(0.0)	0.00 ± 0.00	_	_	0.00 ± 0.00	
Food Contact Surfaces ^b	11	(1.4)	0.04 ± 0.20	_	0.01 ± 0.10	0.03 ± 0.17	
Non-food Contact Surfaces	0	(0.0)	0.00 ± 0.00	_	_	0.00 ± 0.00	
Ware Washing ^b	0	(0.0)	0.00 ± 0.00	0.00 ± 0.00	_	0.00 ± 0.00	

Mean Number of Food Code Violations in 31 Categories by State: Rhode Island (n = 273)							
	No. of V	iolations	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in Each Category(%)ª		Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Water & Ice Supply	2	(0.3)	0.01 ± 0.09	0.00 ± 0.00	_	0.01 ± 0.09	
Waste Water & Sewage Plumbing & Adequate Toilet	10	(1.3)	_	0.04 ± 0.19	_	0.04 ± 0.19	
Facilities	20	(2.6)	_	0.07 ± 0.26	_	0.07 ± 0.26	
Toilets ^b Premises & Equipment	0	(0.0)	_	0.00 ± 0.00	_	0.00 ± 0.00	
Maintenance ^b	10	(1.3)	0.04 ± 0.19	0.04 ± 0.19	_	0.04 ± 0.19	
Lighting & Ventilation Garbage & Recycling Facilities	34	(4.4)	_	0.12 ± 0.34	_	0.12 ± 0.34	
Outside ^b	60	(7.7)	0.22 ± 0.48	—	_	0.22 ± 0.48	
Pest & Animal Controls Storage of Toxic Items & Personal	0	(0.0)	0.00 ± 0.00	_	-	0.00 ± 0.00	
Items Display of Valid Permit &	18	(2.3)	0.07 ± 0.26	_	0.07 ± 0.26	_	
Consumer Advisories	87	(11.2)	0.32 ± 0.56	—	0.32 ± 0.56	-	
Other	201	(25.9)	0.74 ± 0.82	0.62 ± 0.77	0.00 ± 0.06	0.73 ± 0.82	
Total Violations	775						

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.
^b These violation categories included food code violations with both behavioral and non-behavioral components, and researchers were not able to discern which from the health inspection data.

Mean Number of Food Code Violations in 31 Categories by State: Virginia $(n = 1,793)$							
	No. of Violations	ms Mean number of violations per facility ± Standard Deviation					
Violation Categories	in Each Category(%) ^a	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Person in Change	23 (0.8%)	0.01 ± 0.12	_	0.00 ± 0.06	0.01 ± 0.10		
Employee Health	8 (0.3)	0.00 ± 0.07	_	0.00 ± 0.07	0.00 ± 0.00		
Handwashing & Handwash Sinks	171 (5.9)	0.10 ± 0.33	_	0.06 ± 0.24	0.04 ± 0.20		
Personal Cleanliness & Grooming	39 (.3)	0.02 ± 0.16	_	_	0.02 ± 0.16		
Approved Food Sources Protecting Food from	48 (1.7)	0.03 ± 0.17	-	0.03 ± 0.17	0.00 ± 0.00		
Contamination	154 (5.3)	0.09 ± 0.30	0.00 ± 0.00	0.02 ± 0.16	0.06 ± 0.25		
Cooling	39 (1.3)	0.02 ± 0.15	_	0.01 ± 0.11	0.01 ± 0.10		
Reheating	11 (0.4)	0.01 ± 0.08	_	0.01 ± 0.08	_		
Cooking	0 (0.0)	0.00 ± 0.00	_	0.00 ± 0.00	0.00 ± 0.00		
Thawing	7 (0.2)	0.00 ± 0.06	_	_	0.00 ± 0.06		
Time & Temperature Control Adequate Equipment for Cold/Hot	234 (8.1)	0.13 ± 0.38	-	0.13 ± 0.38	-		
Holding	23 (0.8)	_	0.01 ± 0.11	_	0.01 ± 0.11		
Date-marking & Labeling	61 (2.1)	0.03 ± 0.20	_	0.02 ± 0.16	0.01 ± 0.11		
Use of Thermometers & Test Kits Use of Single-use Gloves &	113 (3.9)	_	0.06 ± 0.26	0.00 ± 0.00	0.06 ± 0.26		
Utensils/Bare Hand Contact	21 (0.7)	0.01 ± 0.11	_	0.00 ± 0.00	0.01 ± 0.11		
Use of Utensils & Linens	147 (5.1)	0.08 ± 0.28	0.00 ± 0.00	0.01 ± 0.10	0.07 ± 0.27		
Wiping Clothes	32 (1.1)	0.02 ± 0.13	_	_	0.02 ± 0.13		
Food Contact Surfaces	173 (6.0)	0.09 ± 0.31	0.01 ± 0.09	0.09 ± 0.30	0.01 ± 0.10		
Non-food Contact Surfaces	114 (3.9)	0.06 ± 0.24	0.01 ± 0.08	_	0.06 ± 0.25		
Ware Washing	143 (4.9)	0.06 ± 0.27	0.02 ± 0.13	0.03 ± 0.16	0.05 ± 0.26		

Mean Number of Food Code Violations in 31 Categories by State: Virginia ($n = 1,793$)							
	No. of Violations	Mean number of violations per facility ± Standard Deviation					
Violation Categories	in Each Category(%)ª	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations		
Water & Ice Supply	4 (0.1)	0.00 ± 0.00	0.00 ± 0.05	0.00 ± 0.04	0.00 ± 0.02		
Waste Water & Sewage Plumbing & Adequate Toilet	85 (2.9)	_	0.05 ± 0.22	0.04 ± 0.20	0.01 ± 0.09		
Facilities	55 (1.9)	_	0.03 ± 0.17	0.02 ± 0.14	0.01 ± 0.09		
Toilets Premises & Equipment	23 (0.8)	0.01 ± 0.09	0.00 ± 0.07	_	0.01 ± 0.11		
Maintenance	664 (22.9)	0.30 ± 0.68	0.07 ± 0.27	_	0.37 ± 0.80		
Lighting & Ventilation Garbage & Recycling Facilities	162 (5.6)	0.07 ± 0.27	0.02 ± 0.15	0.00 ± 0.00	0.09 ± 0.32		
Outside	185 (6.4)	0.02 ± 0.14	0.08 ± 0.33	_	0.10 ± 0.37		
Pest & Animal Controls Storage of Toxic Items & Personal	32 (1.1)	0.02 ± 0.13	0.00 ± 0.04	0.01 ± 0.10	0.01 ± 0.09		
Items Display of Valid Permit &	94 (3.2)	0.05 ± 0.23	_	0.05 ± 0.23	0.00 ± 0.02		
Consumer Advisories	0 (0.0)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00		
Other	34 (1.2)	0.01 ± 0.08	0.01 ± 0.11	0.00 ± 0.02	0.02 ± 0.13		
Total Violations	2,899						

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.

Mean Number of Food Code Violations in 31 Categories by State: Wisconsin $(n = 1,605)$							
	No. of V	iolations	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in F Catego	Each ory(%)ª	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Person in Change	33	(1.9%)	0.02 ± 0.14	_	0.02 ± 0.14	_	
Employee Health	10	(0.6)	0.01 ± 0.08	_	0.01 ± 0.08	_	
Handwashing & Handwash Sinks ^b	122	(7.2)	0.08 ± 0.29	0.05 ± 0.24	0.08 ± 0.29	_	
Personal Cleanliness & Grooming	13	(0.8)	0.01 ± 0.09	_	_	0.01 ± 0.09	
Approved Food Sources Protecting Food from	18	(1.1)	0.01 ± 0.11	_	0.01 ± 0.11	0.00 ± 0.00	
Contamination	272	(16.0)	0.17 ± 0.42	_	0.02 ± 0.15	0.15 ± 0.38	
Cooling	25	(1.5)	0.02 ± 0.12	_	0.00 ± 0.06	0.1 ± 0.11	
Reheating	1	(0.1)	0.00 ± 0.03	_	0.00 ± 0.03	_	
Cooking	6	(0.4)	0.00 ± 0.06	_	0.00 ± 0.06	0.00 ± 0.03	
Thawing	5	(0.3)	0.00 ± 0.06	_	_	0.00 ± 0.06	
Time & Temperature Control	69	(4.1)	0.04 ± 0.22	_	0.04 ± 0.22	_	
Holding	-	_	_	_	_	_	
Date-marking & Labeling	75	(4.4)	0.05 ± 0.23	_	0.04 ± 0.20	0.01 ± 0.09	
Use of Thermometers & Test Kits Use of Single-use Gloves &	83	(4.9)	0.05 ± 0.22	_	_	0.05 ± 0.22	
Utensils/Bare Hand Contact	68	(4.0)	0.04 ± 0.21	_	0.01 ± 0.11	0.03 ± 0.18	
Use of Utensils & Linens	46	(2.7)	0.03 ± 0.18	_	_	0.03 ± 0.18	
Wiping Clothes	58	(3.4)	0.04 ± 0.19	_	_	0.04 ± 0.19	
Food Contact Surfaces ^b	188	(11.1)	0.12 ± 0.38	0.10 ± 0.35	0.02 ± 0.15	0.10 ± 0.35	
Non-food Contact Surfaces	57	(3.4)	0.04 ± 0.19	_	_	0.04 ± 0.19	
Ware Washing ^b	89	(5.2)	0.06 ± 0.23	0.06 ± 0.23	_	0.06 ± 0.23	

Mean Number of Food Code Violations in 31 Categories by State: Wisconsin ($n = 1,605$)							
	No. of V	iolations	Mean number of violations per facility ± Standard Deviation				
Violation Categories	in I Catego	Each ory(%)ª	Behavioral Violations	Non-behavioral Violations	Behavioral Violations	Non-critical Violations	
Water & Ice Supply	3	(0.2)	0.00 ± 0.04	0.00 ± 0.00	_	0.00 ± 0.04	
Waste Water & Sewage Plumbing & Adequate Toilet	8	(0.5)	_	0.00 ± 0.07	_	0.00 ± 0.07	
Facilities	59	(3.5)	_	0.04 ± 0.19	_	0.04 ± 0.19	
Toilets ^b Premises & Equipment	33	(1.9)	0.02 ± 0.15	0.02 ± 0.15	_	0.02 ± 0.15	
Maintenance	207	(12.2)	_	0.13 ± 0.41	_	0.13 ± 0.41	
Lighting & Ventilation ^b Garbage & Recycling Facilities	47	(2.8)	0.03 ± 0.18	0.03 ± 0.18	_	0.03 ± 0.18	
Outside	10	(0.6)	0.01 ± 0.09	_	_	0.01 ± 0.09	
Pest & Animal Controls Storage of Toxic Items & Personal	16	(0.9)	0.01 ± 0.11	-	_	0.01 ± 0.11	
Items Display of Valid Permit &	64	(3.8)	0.04 ± 0.21	_	0.04 ± 0.21	_	
Consumer Advisories	11	(0.6)	0.01 ± 0.08	_	0.01 ± 0.08	-	
Other	0	(0.0)	0.00 ± 0.00	_	_	0.00 ± 0.00	
Total Violations	1,696						

^a Total number of violations within each category. If a facility had multiple violations in any categories, the number of violations was recorded instead of number of facilities that violated food code items from each category.
^b These violation categories included food code violations with both behavioral and non-behavioral components, and researchers were not able to discern

which from the health inspection data.