HHS Public Access

Author manuscript

J Environ Health. Author manuscript; available in PMC 2021 June 15.

Published in final edited form as:

J Environ Health. 2020 June ; 82(10): 8–13.

Restaurant Characteristics Associated With the Use of Specific Food-Cooling Methods

Kirsten Reed, MPH,

Laura Brown, PhD

National Center for Environmental Health, Centers for Disease Control and Prevention

Danny Ripley,

Metro Nashville/Davidson County, Public Health Department

Nicole Hedeen, MPH,

Minnesota Department of Health

David Nicholas, MPH,

New York State Department of Health

Brenda Faw,

California Department of Public Health

Lisa Bushnell,

Connecticut Department of Public Health

Priya Nair,

Georgia Department of Public Health

Timothy Wickam

Iowa Department of Public Health

Abstract

Pathogen growth caused by improper or slow cooling of hot foods was a contributing factor in 504 of restaurant- and deli-related outbreaks in the U.S. from 1998–2008. Little is known, however, about restaurant cooling practices. To fill this gap, the Centers for Disease Control and Prevention's Environmental Health Specialists Network (EHS-Net) conducted an observational study to identify and understand factors that might determine which methods restaurants follow to rapidly cool food. These methods include refrigerating food at ≤41 °F, at shallow depths, and in containers that are ventilated, unstacked, and have space around them. EHS-Net personnel collected data through manager interviews and observation of cooling processes in 420 randomly selected restaurants. Regression analyses revealed characteristics of restaurants most likely to use the cooling methods assessed. These characteristics included ownership by restaurant chains,

Corresponding Author: Kirsten Reed, National Center for Environmental Health, Centers for Disease Control and Prevention, 4770 Buford Highway, Atlanta, GA 30341. ntz6@cdc.gov.

manager food safety training and certification, few foods cooled at a time, many meals served daily, and a high ratio of workers to managers. These findings suggest that regulatory food safety programs and the retail industry might improve cooling methods—and reduce outbreaks—by providing and encouraging manager food safety training and certification, and by focusing intervention efforts on independent and smaller restaurants.

Introduction

Improper or slow cooling of hot foods is a significant cause of foodborne illnesses, such as those caused by *Clostridium perfringens* and *Bacillus cereus* (Schaffner et al., 2015). Improper cooling of hot food, leading to pathogen growth, was a contributing factor in 504 U.S. restaurant and deli outbreaks from 1998–2008 (Brown et al., 2012). These outbreaks indicate that food-cooling practices in restaurants need to be improved.

The Food and Drug Administration's (FDA) *Food Code* represents the best food safety recommendations for retail food service establishments (U.S. Department of Health and Human Services [HHS], 2009a). Most state and local food codes are modeled on the FDA *Food Code*, which contains several guidelines to reduce pathogen growth during the cooling of food. These guidelines include cooling food rapidly from 135–70 °F (57–21 °C) within 2 hr and from 135–41 °F (57–5 °C) within a total of ≤6 hr (HHS, 2009b, 2017a). The FDA *Food Code* also includes recommendations for facilitating rapid cooling. These recommendations include refrigerating cooling food and placing cooling food in shallow pans. The *Food Code* also recommends ventilating the food (e.g., leaving containers uncovered or loosely covered) and arranging cooling food to maximize heat transfer through food container walls (e.g., by not placing containers of cooling food close to or on top of each other) (HHS, 2009b, 2017a).

Data on restaurant food-cooling practices can inform cooling interventions but few data were available on restaurant cooling practices. To fill this gap, the Centers for Disease Control and Prevention's (CDC) Environmental Health Specialists Network (EHS-Net) conducted an observational study on restaurant food cooling practices. The goal was to identify gaps in restaurant food cooling practices and to identify restaurant characteristics related to proper food cooling practices. Data from the study indicate that the cooling practices of many restaurants do not meet FDA recommendations for rapid cooling (Brown et al., 2012; Schaffner et al., 2015). For our analysis, we used data from the same study to determine what restaurant characteristics (e.g., ownership type, meals served per day, food safety training and certification) are related to whether restaurants use FDA-recommended methods to facilitate rapid cooling. An understanding of these associations can inform food-cooling interventions, regulatory food safety programs, and the retail industry.

Methods

Data Collection

EHS-Net conducted the study from July 2009–March 2010. EHS-Net is a collaboration of environmental health specialists and epidemiologists focused on examining factors that

contribute to foodborne illness associated with retail food service establishments. EHS-Net members include CDC, FDA, and state and local health departments. When EHS-Net conducted this study, CDC funded nine state and local health departments to participate in EHS-Net. These state and local health departments, or EHS-Net sites, were located in California, Connecticut, Georgia, Iowa, Minnesota, New York, Oregon, Rhode Island, and Tennessee. Each state has its own set of food safety regulations; the regulations vary in how closely they matched FDA *Food Code* guidelines. The study protocol was cleared by the appropriate institutional review boards in each EHS-Net site.

Within each EHS-Net site, EHS-Net site staff (i.e., data collectors) solicited restaurant participation by telephoning randomly selected restaurants within a specified geographic location and following a standardized recruiting script to obtain informed consent. Data collectors from each site collected data in approximately 50 restaurants that cooled foods. As noted by Brown and coauthors (2012), 420 restaurant managers agreed to participate in the study, a participation rate of 68.4%. All data collectors participated in training to increase data collection consistency. We did not collect any data that could identify individual restaurants or staff.

In each restaurant, data collectors conducted prearranged on-site interviews with English-speaking kitchen managers about restaurant characteristics. These restaurant characteristics included number of meals served daily, ownership (independent versus chain), cuisine type (e.g., American, Chinese, etc.), kitchen manager experience, number of kitchen managers and food workers, and if kitchen managers and food workers were trained or certified in food safety. For this study, a person was considered certified if they had successfully completed a food safety training or educational program and received a certificate upon completion.

In restaurants that were cooling food during the on-site visit, data collectors also recorded their observations about the cooling processes being used. Some restaurants were cooling multiple foods or using multiple steps to cool food (e.g., refrigerating food in a large, deep container and then separating the food into shallow containers would be two separate steps). For each cooling step of each food at each restaurant, data collectors assessed the overall method of cooling (e.g., refrigeration) and the specifics of each method (e.g., ambient temperature of the refrigeration unit).

Previous analyses of data from this study indicate that restaurants most frequently cool food by refrigeration. Other methods include placing food in blast chillers and placing ice wands in food (Brown et al., 2012). This article examines data on food cooled through refrigeration. Data collectors determined whether the refrigeration units used for cooling could maintain food temperatures of ≤41 °F by assessing whether the ambient temperature of the refrigeration units was ≤41 °F (measured from centermost point of cooling unit) (HHS, 2017b). For each food cooled with refrigeration at the time of the on-site visit, data collectors assessed if several FDA-recommended methods for cooling were used. Specifically, they assessed if the cooling food was at a shallow depth (≤3 in.), the food was ventilated (loose covering or perforations or holes in covering), and the containers within refrigeration units were arranged to maximize heat transfer through food container walls. We

used two measures to determine if equipment was arranged to maximize heat transfer: 1) if the cooling food containers were unstacked and 2) if there was open air space around food containers (cleared area around sides and top of containers ≥3 in.).

Statistical Analysis

We first created a categorical measure for each of the five methods we assessed. If all of the foods in a restaurant were cooled with the specific method, then the restaurant was coded as consistently using that method. If at least one of the foods was not cooled with that method, then the restaurant was coded as not consistently using that method. For example, if a restaurant cooled two foods, and for one food the container was ventilated but for the other food the container was not ventilated, then the restaurant would be coded as not consistently ventilating their cooling food containers.

We also created an overall measure of cooling methods. This measure assessed the average percent of foods in a restaurant being cooled using all five of the assessed methods. For example, if a restaurant cooled two foods, and one of those foods was cooled using all five (100%) of the methods, and the second food was cooled using two (40%) of the methods, then this restaurant's average percent of use of all methods would be 70%, the average of these two percentages.

We then built five regression models—one for each of the five methods—to examine associations between restaurant characteristics and the outcome variable: if restaurants consistently used the method. Because these outcomes were categorical (consistently used the method versus did not consistently use the method), we used logistic modeling methods for these models. Finally, we built a regression model to examine associations between restaurant characteristics and the outcome variable measuring overall use of cooling methods (i.e., the average percent of use of all recommended methods). Because this outcome is continuous, we used linear modeling methods for this model. Final models for each regression were chosen using a backward selection level of 0.05. We stratified by EHS-Net site to account for potential differences inherent to sites, such as differing data collectors and food safety regulations.

Results

Restaurant Characteristics

As noted by Brown and coauthors (2012), 420 restaurant managers agreed to participate in the study, which is a participation rate of 68.4%. Analyses for this article were based on data from the 351 restaurants in which at least one food was cooled by refrigeration. Across these 351 restaurants, we observed 508 cooling foods. In most of these restaurants, data collectors observed one food being cooled (70.9%), but in 29.1% of restaurants, data collectors observed between two and six foods being cooled.

Interview responses from kitchen managers indicated that these restaurants primarily served American cuisine (61.0%), were independently owned (68.7%), served ≤150 meals a day (51.9%), had workers who mostly spoke English in the kitchen (78.3%), had cooling policies in place (80.8%), and required kitchen managers to be certified in food safety

(58.6%) (Table 1). About one half of kitchen managers indicated that they had worked at the restaurant for ≤4 years (50.7%), at least one kitchen manager had been trained in food safety (94.9%), and at least one kitchen manager was certified in food safety (73.6%) (Table 1). Most restaurants employed ≤2 kitchen managers (67.5%), ≤7 food workers (51.9%), and most food workers had received training in food safety (93.7%).

Use of Cooling Methods

Table 2 shows the frequency with which restaurants followed these five methods: 1) refrigeration unit is maintained at ≤41 °F, 2) cooling food is stored at shallow depth, 3) cooling food is ventilated, 4) cooling food containers are unstacked, and 5) cooling food containers have open air around them. In most restaurants (80.3%), the refrigeration units in which the cooling food was stored were ≤41 °**F** (Table 2). In most restaurants (79.5%), food was consistently cooled in unstacked containers, and in most restaurants (79.5%), food was consistently cooled in containers with space between them. Furthermore, in 59.8% of restaurants, food was consistently cooled in ventilated containers, and in 49.0% of restaurants, food was consistently cooled at shallow food depths. In only 18.2% of restaurants, however, were all five methods consistently used. On average, restaurants' mean percent of foods cooled using all of the methods was 74.1% (*SD* = 20.4%, median = 80.0%).

Regression: Individual Cooling Methods Consistently Used in Restaurants

Multiple logistic regressions identified five explanatory variables that were significantly associated ($p < .05$) with restaurants consistently using at least one of the five assessed methods to facilitate rapid cooling (Table 3). These five variables included: 1) restaurant ownership, 2) kitchen manager training, 3) kitchen manager certification, 4) number of foods cooling in refrigeration, and 5) ratio of food workers to kitchen managers. Compared with independent restaurants, chain restaurants had 2.1 times greater odds (95% confidence interval [*CI*] [1.01, 4.15]) of consistently storing cooling food at the recommended refrigeration temperature (≤41 °F) (Table 3).

Restaurants that employed at least one food safety-certified kitchen manager had 2.1 times greater odds (95% *CI* [1.10, 4.17]) of consistently ventilating cooling food than did restaurants that did not employ food safety-certified kitchen managers (Table 3). Restaurants that cooled only one food during the observation had almost 2 times greater odds (odds ratio [*OR*] = 1.90; 95% *CI* [1.02, 3.54]) of consistently following the recommendation to not stack containers than did restaurants that cooled more than one food (Table 3).

Restaurants that employed at least one food safety-trained kitchen manager had 4.7 times greater odds (95% *CI* [1.38, 15.91]) of consistently not stacking containers than did those that did not use any food safety-trained kitchen managers. Restaurants that cooled only one food during the observation had 3.7 times greater odds (95% *CI* [1.79, 7.42]) of consistently leaving space between containers than restaurants that cooled more than one food. Restaurants where any kitchen managers were certified in food safety had 3.4 times greater odds (95% *CI* [1.30, 9.11]) of leaving space between containers compared with those without food safety-certified kitchen managers (Table 3). Restaurants with a high food-worker-to-kitchen-manager ratio (>4) had 2.7 times greater odds (95% *CI* [1.10,

6.60]) of consistently leaving space between containers than did restaurants with a low food-worker-to-kitchen-manager ratio (≤2) (Table 3).

Regression: Average Percent of Cooling Methods Used in Restaurants

Multivariable linear regression analyses identified two significant explanatory variables: 1) number of meals served daily and 2) kitchen manager food safety training. Those two variables were significantly associated ($p < .05$) with a difference in the average percent of recommended methods used in restaurants (Table 4). On average, restaurants serving >300 meals a day used 6.7% more recommended cooling methods (95% *CI* [0.1%, 13.2%]) compared with restaurants that served 150–300 meals a day (Table 4). On average, restaurants that employed any food safety-trained kitchen managers used 15.0% more recommended methods (95% *CI* [4.8%, 25.1%]) than restaurants that did not employ food safety-trained kitchen managers (Table 4).

Discussion

This study identified associations between several restaurant characteristics and restaurant use of methods to rapidly cool food. Regression analyses showed that the odds of restaurants using these methods were greater for chain restaurants, restaurants where at least one kitchen manager was food safety-certified or food safety-trained, where only one food was cooled at a time, and where the ratio of food workers to kitchen managers was high. Furthermore, a greater percentage of methods were used to cool foods in restaurants that served >300 meals a day, and where any kitchen manager was food safety certified.

Restaurants that were cooling only one food during the observation were more likely to not stack containers and to leave space between containers. Restaurants cooling more than one food at a time might have inadequate refrigeration space for cooling these foods, forcing workers to stack containers and store food containers close to each other. Restaurants might not be able to increase their space but they might be able to adjust food preparation processes to reduce the number of foods cooled at one time.

Restaurants under chain ownership were more likely to follow recommended cooling methods than those with independent ownership, as were those serving more meals daily compared with those serving fewer meals daily. These findings are consistent with other data suggesting that chain and larger establishment food safety practices tend to be better than those of independent and smaller establishments (Green et al., 2005, 2007; Lee et al., 2004). These restaurants might have more resources, more or better trained staff, or more standardized food safety procedures. The restaurants also might be larger or have better or larger cooling equipment, and thus have more space for cooling. The relationship between worker-to-manager ratio and the use of recommended cooling methods also might be a function of restaurant size.

The cooling methods examined in this article help ensure that foods cool quickly, thereby reducing foodborne illness risk. Schaffner and coauthors (2015) found that following recommended cooling methods led to faster estimated cooling rates. Our results suggest that restaurants with food safety-trained or food safety-certified kitchen managers were

more likely to follow these recommended methods to facilitate rapid cooling. Our finding is consistent with other research indicating that kitchen manager training and certification are important contributors to food safety in retail settings (Bogard, Fuller, Radke, Selman, & Smith, 2013; Brown, 2013; Brown et al., 2012, 2016, 2018; Hedberg et al., 2006; HHS, 2009a; Lipcsei et al., 2018).

Our study has several limitations. First, because data were collected only in restaurants with English-speaking managers, they might not reflect practices in restaurants that lack English-speaking managers. Second, only one restaurant of any given chain was included in the study because restaurants of the same chain were expected to have similar cooling practices. This sampling method likely resulted in an undersampling of chain restaurants. Third, manager interview data might be affected by social desirability bias, which results in over-reporting of socially desirable responses (e.g., existence of food safety policies). Fourth, the cross-sectional nature of this study does not allow causal inferences about relationships between restaurant characteristics and cooling methods. Fifth, data were collected through observations. When people are observed, they might change their behavior to meet the expectations of the observer.

This study, however, mostly involved observations of equipment rather than of people. For example, data collectors went into refrigerators and examined whether food cooling containers were stacked on top of one another. Despite any possible observation bias, data collectors noted improper cooling practices in many establishments. Finally, we collected the data between 2009 and 2010. Current regulations on recommended cooling methods, however, remain similar to regulations in place during the data collection. Furthermore, improper cooling continues to be a source of foodborne outbreaks in restaurants and contributed to 10% (63) of U.S. restaurant outbreaks from 2014–2016 (Centers for Disease Control and Prevention, 2019). These facts suggest that the data reported here likely are still relevant.

Conclusion

The findings in this article can inform interventions to prevent foodborne illness and outbreaks related to improper cooling of foods. We found that kitchen manager training and certification were associated with better cooling methods. Regulatory food safety programs and the retail industry should consider providing and encouraging kitchen manager training and certification. Regulatory programs also might consider targeting interventions in independent and smaller restaurants, given that these restaurants were less likely to use recommended methods when cooling foods. Finally, corrective actions in restaurants might need to include adjustments to current food preparation and cooling processes based on available space and equipment for food cooling.

Research consistently finds that chain restaurants use better food safety practices compared with independently operated restaurants but little published research examines why this difference exists. A better understanding of why chain ownership is associated with better food safety practices could provide insight into ways independently operated restaurants can

improve food safety. Future studies should investigate what advantages chain restaurants have over independent restaurants.

Acknowledgements:

This study was conducted by states receiving CDC grant awards funded under CDC-RFA-EH10-001. We thank Laurie Williams of FDA for helpful comments on the manuscript. We also thank the restaurant managers and owners who participated in this study.

References

Bogard A, Fuller CC, Radke V, Selman CA, & Smith KE (2013). Ground beef handling and cooking practices in restaurants in eight states. Journal of Food Protection, 76(12), 2132–2140. [PubMed: 24290692]

Brown LG (2013). EHS-Net restaurant food safety studies: What have we learned? Journal of Environmental Health, 75(7), 44–45.

Brown LG, Hoover ER, Faw BV, Hedeen NK, Nicholas D, Wong MR, … Kause JR (2018). Food safety practices linked with proper refrigerator temperatures in retail delis. Foodborne Pathogens and Disease, 15(5), 300–307. [PubMed: 29498545]

Brown LG, Hoover ER, Ripley D, Matis B, Nicholas D, Hedeen N, & Faw F (2016). Retail deli slicer cleaning frequency—Six selected sites, United States, 2012. Morbidity and Mortality Weekly Report, 65(12), 306–310. [PubMed: 27031689]

Brown LG, Ripley D, Blade H, Reimann DW, Everstine K, Nicholas D, … EHS-Net Working Group. (2012). Restaurant food cooling practices. Journal of Food Protection, 75(12), 2172–2178. [PubMed: 23212014]

Centers for Disease Control and Prevention. (2019). National Outbreak Reporting System (NORS). Retrieved from https://www.cdc.gov/nors/index.html

Green LR, Radke V, Mason R, Bushnell L, Reimann DW, Mack JC, … Selman CA (2007). Factors related to food worker hand hygiene practices. Journal of Food Protection, 70, 661–666. [PubMed: 17388056]

Green LR, Selman C, Scallan E, Jones TF, Marcus R, & the EHS-Net Population Survey Working Group. (2005). Beliefs about meals eaten outside the home as sources of gastrointestinal illness. Journal of Food Protection, 68(10), 2184–2189. [PubMed: 16245727]

Hedberg C, Smith S, Kirkland E, Radke V, Jones T, Selman C, & EHS-Net Working Group. (2006). Systematic environmental evaluations to identify food safety differences between outbreak and nonoutbreak restaurants. Journal of Food Protection, 69(11), 2697–2702. [PubMed: 17133814]

Lee R, Beatty M, Bogard A, Esko M-P, Angulo F, Selman C, & EHS-Net Working Group. (2004). Prevalence of high-risk egg-preparation practices in restaurants that prepare breakfast egg entrées: An EHS-Net study. Journal of Food Protection, 67(7), 1444–1450. [PubMed: 15270499]

Lipcsei LE, Brown LG, Hoover ER, Faw BV, Hedeen N, Matis B, … Ripley D (2018). Retail deli slicer inspection practices: An EHS-Net study. Journal of Food Protection, 81(5), 799–805. [PubMed: 29637808]

Schaffner DW, Brown L, Ripley D, Reimann D, Koktavy N, Blade H, & Nicholas D (2015). Quantitative data analysis to determine best food cooling practices in U.S. restaurants. Journal of Food Protection, 78(4), 778–783. [PubMed: 25836405]

U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration. (2009a). Recommendations of the United States Public Health Service Food and Drug Administration: Food Code. College Park, MD: Author. Retrieved from https://wayback.archive-it.org/7993/20170406184540/https://www.fda.gov/downloads/Food/GuidanceRegulation/UCM189448.pdf

U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration. (2009b). Chapter 3, Food; Part 3–5: Limitation of growth of organisms of public health concern. In: FDA Food Code. College Park, MD: Author. Retrieved

from https://wayback.archive-it.org/7993/20170406184540/https://www.fda.gov/downloads/Food/GuidanceRegulation/UCM189448.pdf

U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration. (2017a). Chapter 3, Food; Part 3–5: Limitation of growth of organisms of public health concern. In: FDA Food Code. College Park, MD: Author. Retrieved from https://www.fda.gov/downloads/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/UCM595140.pdf

U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration. (2017b). Annex 3, Public health reasons/administrative guidelines; Chapter 4: Equipment, utensils, and linens. In: FDA Food Code. College Park, MD: Author. Retrieved from https://www.fda.gov/downloads/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/UCM595140.pdf

TABLE 1

Frequency and Percent of Restaurant Characteristics Obtained From Manager Interviews

Restaurant Characteristic	#	%
Cuisine (*N* = 351)		
American	214	61.0
Other	137	39.0
Ownership type (*N* = 351)		
Independent	241	68.7
Chain	110	31.3
Language spoken most often (*N* = 351)		
English	275	78.3
Other	76	21.7
Meals served daily (*N* = 341)		
≤150	177	51.9
150–300	81	23.8
>300	83	24.3
Restaurant has cooling policy (*N* = 350)		
No	48	19.2
Yes (not written)	202	80.8
Yes (written)	100	49.5
Kitchen manager certification required (*N* = 343)	201	58.6
Food-worker-to-kitchen-manager ratio (*N* = 349)		
≤2	97	27.8
2–4	125	35.8
>4	127	36.4
Kitchen manager has been at the restaurant (*N* = 351)		
≤4 yr	178	50.7
>4 yr	173	49.3
Number of kitchen managers (*N* = 351)		
≤2	237	67.5

Restaurant Characteristic	#	%
>2	114	32.5
Any kitchen managers received food safety training (*N* = 351)		
No	18	5.1
Yes	333	94.9
Kitchen manager training includes cooling (*N* = 329)		
No	6	1.8
Yes	323	98.2
Kitchen manager is food safety certified (*N* = 349)	257	73.6
Number of food workers (*N* = 349)		
≤7	181	51.9
>7	168	48.1
Food workers received food safety training (*N* = 347)		
No	22	6.3
Yes	325	93.7
Worker food safety training includes cooling (*N* = 319)		
No	22	6.9
Yes	297	93.1

Note. N equals the denominator for the question; values vary throughout the table because of skip patterns and nonresponses in the interview.

TABLE 2

Frequency and Percent of Restaurants That Consistently Used Recommended Methods to Facilitate Rapid Cooling (N = 351)

Cooling Method Used	#	%
Ambient refrigeration temperature ≤41 °F	282	80.3
Unstacked containers	279	79.5
Space between containers	254	72.4
Ventilated food	210	59.8
Shallow food depth (≤3 in.)	172	49.0
All recommended methods	64	18.2

TABLE 3

Multiple Logistic Regression Odds Ratios of Restaurant Characteristics Associated With Each of the Five Food and Drug Administration-Recommended Methods to Facilitate Rapid Cooling Being Used With All Foods Cooled[ab]

Restaurant Characteristic	Odds Ratio (*OR*)	95% Confidence Interval (*CI*)	*p*-Value
Ambient refrigeration temperature ≤41 °F (*N* = 351)			
Chain ownership (reference = independent)	2.05	1.01, 4.15	.047
Ventilated food (*N* = 349)			
Kitchen manager is food safety certified (reference = not certified)	2.13	1.10, 4.17	.027
Unstacked containers (*N* = 351)			
One food cooled (reference = >one food)	1.90	1.02, 3.54	.043
Kitchen manager has food safety training (reference = not trained)	4.70	1.38, 15.91	.013
Space between containers (*N* = 347)			
One food cooled (reference = >one food)	3.65	1.79, 7.42	<.001
Kitchen manager is food safety certified (reference = not certified)	3.44	1.30, 9.11	.013
Ratio of food workers to kitchen managers (reference = ≤2)[c]			
2–4	0.94	0.43, 2.05	.094
>4	2.71	1.10, 6.60	.008

[a]None of the restaurant characteristics considered was significantly associated with restaurants meeting the recommended method of ensuring rapid cooling, which is food depth of ≤3 in.

[b]*N* values vary throughout the table because of skip patterns and nonresponse in the interview.

[c]For the overall *OR*, $p = .026$.

TABLE 4

Linear Regression of Restaurant Characteristics Associated With the Average Percent of Food and Drug Administration (FDA)-Recommended Methods Used With Refrigeration in Restaurants ($N = 326$)

Restaurant Characteristic	Mean Difference	95% Confidence Interval (*CI*)	*p*-Value
Meals served daily (reference = 150–300)[ab]			
≤150	−3.6%	−9.0%, 1.8%	.187
>300	6.7%	0.1%, 13.2%	.045
Kitchen manager has food safety training (reference = not trained)[c]	15.0%	4.8%, 25.1%	.004

[a]Average percentage of FDA-recommended methods used among restaurants serving 150–300 meals daily = 74.9%, $SD = 20.9\%$.

[b]For the overall average percent difference, $p = .004$.

[c]Average percentage of FDA-recommended methods used among restaurants without a food safety-trained kitchen manager = 59.2%, $SD = 25.2\%$.