

# Evaluating North Carolina Food Pantry Food Safety–Related Operating Procedures

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## ABSTRACT

Almost one in seven American households were food insecure in 2012, experiencing difficulty in providing enough food for all family members due to a lack of resources. Food pantries assist a food-insecure population through emergency food provision, but there is a paucity of information on the food safety–related operating procedures used in the pantries. Food pantries operate in a variable regulatory landscape; in some jurisdictions, they are treated equivalent to restaurants, while in others, they operate outside of inspection regimes. By using a mixed methods approach to catalog the standard operating procedures related to food in 105 food pantries from 12 North Carolina counties, we evaluated their potential impact on food safety. Data collected through interviews with pantry managers were supplemented with observed food safety practices scored against a modified version of the North Carolina Food Establishment Inspection Report. Pantries partnered with organized food bank networks were compared with those that operated independently. In this exploratory research, additional comparisons were examined for pantries in metropolitan areas versus nonmetropolitan areas and pantries with managers who had received food safety training versus managers who had not. The results provide a snapshot of how North Carolina food pantries operate and document risk mitigation strategies for foodborne illness for the vulnerable populations they serve. Data analysis reveals gaps in food safety knowledge and practice, indicating that pantries would benefit from more effective food safety training, especially focusing on formalizing risk management strategies. In addition, new tools, procedures, or policy interventions might improve information actualization by food pantry personnel.

The estimated U.S. national prevalence of food insecurity has remained steady at around 14.5% since 2008 (7). Access to adequate food is limited in food-insecure households due to a lack of money and other resources. An estimated 5.7% of households had very low food security in 2012, defined as when one or more household members reduced or altered their eating patterns at times during the year due to limited resources (7). Nationally, North Carolina ranks 12th in terms of food-insecure children, with 27.3% of the state's children (618,200) categorized as food insecure and 19.3% of individuals overall categorized as food insecure (13, 16). Although government assistance is available to some, it is not sufficient for many families, leaving them to seek out emergency food providers (2, 9, 23).

A food bank is generally a warehouse (or series of warehouses) that stores and distributes food obtained from producers, retailers, federal commodity programs, and the food industry to food pantries (1, 8). Stored food is then distributed to assist the food-insecure populations and, given the rising interest in reducing food waste, even more food is expected to be recovered in the future (15, 17). A food pantry is a charitable distribution agency that provides

clients with food and grocery products for home preparation and consumption (12). Food pantries are classically the distributors of emergency food at the local level (1, 8).

There are approximately 2,500 agencies, including food pantries, partnered with seven regional food banks and an estimated hundreds more independent food pantries in North Carolina (21). The food banks are affiliated with Feeding America, a nationwide network of emergency food providers; each one represents one of seven regions in the state, with one food bank region crossing over others (21). Although food banks are provided guidance from Feeding America, individual policy can vary in practice at the pantry level. Millions of individuals contract foodborne illness each year, stemming from grocery stores, hospitals, prisons, church dinners, county fairs, restaurants, private homes, schools, and even meal programs, such as Meals on Wheels (5, 25, 26, 30). The number of foodborne illnesses that come directly from food pantries has not been quantified, but they accept food from sources that have been a source of outbreaks and foodborne illnesses: food banks, restaurants, caterers, churches, grocery stores, and private homes. Given that clients also obtain food elsewhere and their potential lack of health care access, it is especially difficult to trace foodborne illnesses to a food pantry.

With various publications on the innumerable aspects of foodborne illnesses, only recently have researchers begun to

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explore the potential connection between food-insecure populations and risk of foodborne illness, especially for difficult-to-trace emergency foods (18, 20, 24). Populations of lower socioeconomic status are suspected to experience greater rates of foodborne illness, although this is difficult to demonstrate (24). Fruits and vegetables are rising in demand at the food pantries and banks, given their high nutritional value (19); however, this may raise potential food safety risks because fresh fruits and vegetables have increasingly been linked to foodborne illness (3, 11). Some food banks and pantries have also begun to host community gardens, with various levels of attention to food safety (6).

The purpose of this research was to explore food safety–related standard operating procedures (SOPs) of food pantries in North Carolina through a mixed methods approach to provide deeper analysis as to the drivers behind specific practices. Given the paucity of data in this aspect of food research, this work is exploratory in nature. Pantries partnered with a food bank were compared with those that operate independently.

## MATERIALS AND METHODS

**Sample selection.** Population and food bank region were stratified to obtain a 12-county sample that was both a generalizable and representative sample of North Carolina. Four categories were created based on the nine urban, rural, and metropolitan divisions used by the U.S. Census Bureau (27). Counties were stratified by their metropolitan status (defined as being part of a metropolitan statistical area of 1 million or more, 250,000 to 1 million, and fewer than 250,000 people) and nonmetropolitan status (defined as urban or rural populations of varying levels adjacent and nonadjacent to metro areas). A random number generator was used to select 12 counties, 6 in metro areas and 6 in nonmetro areas, including counties with over 200,000 people and rural counties not adjacent to metro areas. The counties are representative of the state. Each county has a child food-insecurity rate over 21% (with the highest at 35.2%), and the overall rates of food insecurity range from 15.3 to 23.7%, almost 10 points higher than the national average (15).

**Participant recruitment.** A list of food pantries in the 12 selected counties was created from a review of North Carolina food bank Web sites and Web searches conducted for independent food pantries. The executive director of the North Carolina Association of Feeding America Food Banks was also a source of food bank and pantry contact information. From February to May 2014, food pantry managers were recruited to participate in the study by phone and e-mail with the same script. Pantry managers were informed that the study focused on food safety and would require both an interview and collection of observational data in the pantry. Of the 282 food pantries contacted by phone, e-mail, or both, 174 pantries did not respond or could not be reached. Three of the pantry managers explicitly said that they did not want to participate. As a result, 105 pantries accepted the invitation to participate in the study—a 37.2% response rate. Twenty-one of the known pantries had disconnected or unknown phone numbers, leaving their operation in question. Food bank employees suggested that their partner lists might not be up-to-date. As a result of the 177 pantries in the population that did not take part in the research, the study is limited due to the selection bias of the participants, though the estimated impact on the analysis is minimal.

All North Carolina food bank regions were represented in the participant food pantries. Seventeen food pantries operated independently of Feeding America. Partnership with a Feeding America food bank allows for participation in two federal programs: The Emergency Food Assistance Program (TEFAP) and Supplemental Nutrition Assistance Program (SNAP; these are SNAP commodities, not the Electronic Benefit Transfer cards distributed to individuals and families for grocery store purchases) (28). In some cases, the partnership with Feeding America also allows for a pantry to receive items from local grocery stores, as well as food safety training opportunities and requirements.

**Research using human subjects.** All procedures for this study were reviewed and determined to be exempt by the Institutional Review Boards of the University of North Carolina at Chapel Hill and North Carolina State University. To address concerns about confidentiality, participants were informed that pseudonyms of the individuals and food pantries would be used in any publications, participation was voluntary, and questions could be skipped at any time. Interviews were conducted in a space at the food pantry chosen by the participant. To provide an environment of trust, the intention of the interviewer was to display interest in the participant, avoid reactionary responses, and be mindful of his or her time.

**Data collection.** Pantry operation schedules and distribution strategies are varied. When possible, participating pantries were visited during food distribution or while food bags were packed ( $n = 70$ ); if not, the pantry manager provided a tour of the pantry and explained its operating procedures ( $n = 35$ ). After the participant orally consented, each interview lasted from 40 min to 2 h. The participants received no compensation for their time. Each interview was handwritten or typed (Microsoft Word, version 14.4.3, Microsoft Corporation, Redmond, WA, 2011), and all handwritten notes were later typed for both qualitative and quantitative analysis. The data were collected from June to September 2014.

A questionnaire was developed and used to collect the data during the interview (Table 1). The questions were presented to the managers via a semistructured interview in the pantry, and observations regarding pantry procedures were recorded as the pantry tour was provided. The questionnaire was pilot tested for clarity and wording by two pantry managers outside the sample and by North Carolina Cooperative Extension researchers for accuracy and extensiveness. Pantry managers were queried about (i) the sources and delivery methods of the foods, (ii) types of foods distributed, (iii) storage and distribution procedures, (iv) supplier requirements, (v) use of past-date foods, and (vi) information on recalls. In addition, a modified version of the North Carolina Food Establishment Inspection Report (22) was used to collect information on foodborne illness risk factors and control measures observed during the visit to and tour of the pantries; depending on the type of pantry (distribution of nonperishables only; perishables and nonperishables; perishables and nonperishables, as well as on-site food preparation), the following criteria were assessed: behaviors on hand washing, barehand contact with ready-to-eat (RTE) foods, thermometer use, and general prevention of contamination. The modified version lacks the questions on nonpertinent risk issues, including shell-stock, consumer advisory, food additives, reduced oxygen packaging, obtaining variance on specialized processing methods, and certain physical facilities criteria (backflow, sewage disposal, and lighting requirements). All other observations were based on the type of facility; that is, in food pantries where food is not

TABLE 1. Interview questionnaire

Question	Subquestion
Please describe your position at the pantry.	a. Are you the manager of the pantry? b. Are you the manager of the volunteers? c. Is it a paid or volunteer position? d. Do you directly supervise the volunteers during their shifts? e. Were you trained to manage the volunteers?
What is the paid staff to volunteer ratio?	a. How many volunteers are there per shift? b. How long is a volunteer shift? c. Are the volunteers regular or do they shift often? d. What is the age range of the volunteers?
What are the kinds of tasks that volunteers fill at your food pantry?	a. Are there written descriptions for the different volunteer positions? i. If so, can you provide them? ii. If not, can you explain the positions? b. How are they assigned those positions? c. Are the volunteers responsible for the intake of donations? d. Do volunteers pick up foods from other locations and deliver them to the pantry? e. If so, do they drive their own vehicle? f. Are the volunteers responsible for deciding on the quality of the goods—whether they are worth taking?
How do you keep track of the volunteers and their jobs at the food pantry?	a. Is there a sign-in sheet? b. Is there a screening process to become a volunteer? An application? c. What do you ask when someone decides to volunteer? d. Are the volunteers trained? In what? Is there a training manual?
Is there protocol for ill volunteers?	
Have you received any food safety or food handling training?	
Do you distribute food past the date on the package?	a. What is the reasoning behind the rule?
Does the pantry have particular requirements for its suppliers?	
Are foods repackaged at the food pantry?	a. Please provide specifics. b. What kinds?
Do you tend to know when a donation will be made?	

prepared, no scoring took place regarding hot and cold holding, cooking, and reheating.

**Data analysis and statistics.** The pantries were categorized by city, county, food bank region (if partnered), and days per month in operation; each variable was numerically coded under a unique identifier. No missing data were imputed. Beyond additional questions regarding the supply chain and organizational readiness of the pantries, the interview questions regarding SOPs resulted solely in dichotomous variables, such as managerial knowledge of recalls, distribution of past-date items, and access to hand washing sinks. Food Establishment Inspection Report scores were coded with number of demerit points (count variables) and if the action was unobserved or not applicable.

Interview responses were coded in NVivo10 (QSR International, Melbourne, Australia, 2014). The software allowed for analysis based on certain themes, particular phrases (for example, “take at their own risk”), or any other repeated responses. Themes

established included concerns about waste, worries about liability or sickness or both, and reasoning for the distribution of past-date items (or lack thereof). Although most of the qualitative insights are intertwined with the quantitative results, additional themes are situated in a latter section.

Descriptive statistics have been generated for key variables. Associations between certain operating procedures and food bank partnership, training in food safety, or the rural-urban divide were examined by using two-sample *t* tests in Stata11.2 (Statacorp LP, College Station, TX, 2009). Statistical significance is reported at the 90% confidence level.

## RESULTS

**Organization.** Each food pantry had a different organizational structure, from paid employees versus unpaid volunteers, the number of people it took to run the operation, the length of a typical volunteer shift, the ages of the

TABLE 2. Food pantry organizational characteristics

Pantry characteristic	Pantries with characteristic	Food bank partner	Independent
Paid manager	43	35	8
Managers trained in managing volunteers	31	27	4
Regular volunteers on each shift	81	67	14
Use of sign-in sheet	48	41	7
Volunteers responsible for intake of food	78	66	12
Volunteers decide on quality of foods	91	76	15
Volunteers drive own vehicle to pick up food	61	50	11
Volunteers trained	42	37	5
Volunteer requirements	29	24	5
Total no. of pantries	105	88	17

volunteers, required trainings, and volunteer requirements, as well as their agency within the organization, namely, who decided on quality and picked up the food. In general, volunteers stocked shelves and refrigerators, packed bags of food, and assisted clients in completing paperwork (either for the federal programs or specific to the pantry). Pantries distributed the same number of bags to each client ( $n = 47$ ) or based on family size ( $n = 49$ ), and some distributed on an “emergency basis” ( $n = 23$ ). Six pantries also distributed pet food.

Eighty-two of the participating food pantries (78.1%) distribute both perishable and nonperishable items. Twelve of the pantries (11.4%) serve food prepared in an on-site kitchen in addition to distributing bags of food. Nine pantries (8.6%) only distribute nonperishable foods. Of the pantries that partner with a food bank ( $n = 88$ ), 74 of them (70.5%) participate in at least one federal commodity program, either TEFAP or SNAP or both. The pantries store perishable items for various lengths of time and require a good food safety culture—in this case, an understanding of time-temperature control, cross-contamination, and hand washing behavior.

Pantry organizational characteristics are presented in Table 2. Although pantries described the person in charge by varying titles, the most prevalent one was manager. Less than one-third of the managers were paid. In faith-based institutions, the pantries are often part of a ministry ( $n = 21$ ) and to work in the pantry is part of one’s service to the church. Most pantries (80.2%) had regular volunteers, defined as a person who repeatedly helped in the pantry for no wage but also did not require training upon each visit. One pantry had no volunteers and only paid staff. Only 48 of 105 pantries used a sign-in sheet to keep track of who was volunteering on any particular day. In more than 90% of the pantries, the volunteers were responsible for food quality decisions, including food safety. In 77.2% of the pantries, the volunteers were also responsible for food intake, namely, how and where it was stored and how quickly it was put away. Only 41.2% of the volunteers reportedly went through any training at the pantry, including but not limited to, food safety. Almost two-thirds of the pantries had volunteers that used personal vehicles to pick up the food. Only 28.8% of the pantries had requirements for their volunteers to participate, ranging from church membership to passing a formal background check.

**Food bank partnership.** Two-sample  $t$  tests were performed on each pantry characteristic to identify differences between the food pantries that did and those that did not partner with food banks (Table 3). Food safety training for managers ( $P < 0.01$ ), distribution of leftover prepared foods ( $P < 0.05$ ), repackaging food on-site ( $P < 0.1$ ), knowledge of recalls ( $P < 0.1$ ), and the use of past-date foods ( $P < 0.01$ ) were all significantly associated with differences in food bank partnership and could have profound impacts on foodborne illness risk for pantry clients. Of the 88 pantries that partnered with food banks, 74 participated in TEFAP, SNAP, or both programs.

Managers at 77 pantries had received some food safety training, with a significant difference found between the food bank partners and independent pantries ( $P < 0.01$ ); 65 of those managers received the training from the food bank. The U.S. Department of Agriculture Food and Nutrition Service requires a nondiscrimination training for TEFAP participation, which some food banks couple with food safety training. Pantry managers also receive the same information without accredited food handling certification. The managers receive food safety information at a variable rate. Responses included the following: yearly; multiple times per year; once every 2, 3, or 5 years; annual handouts but no course requirement; only when a pantry first participated in TEFAP; and only if they “handled food” (rather than just stored and distributed). Five pantry managers explained that the training at the food bank was geared towards food handling and preparation rather than storage—that the food bank should not require the training because they “don’t feed people.”

Given the desire to take whatever food was offered and sort through its contents later, most pantries had few requirements for their suppliers beyond type (i.e., no glass) and size of packaging. Almost half of the food pantries repackaged food on-site, with a significant difference between those that did and those that did not partner with the food bank ( $P < 0.10$ ). For the most part, this task involved repackaging multipound bags of dry goods, such as beans, rice, and sugar into small Ziploc bags, though managers also reported repackaging many RTE foods: putting leftover pizza slices into single-serving bags, chopping and freezing fresh vegetables, and repackaging leftover catered items into single-serving containers. Without prompting, 23 pantry managers indicated that those who

TABLE 3. Average prevalence of particular pantry characteristics by food bank partnership<sup>a</sup>

Characteristic	Total no. of pantries with characteristic	Food bank partner			Independent <sup>b</sup>			Significance
		Mean	SD	<i>n</i>	Mean	SD	<i>n</i>	
Manager food safety training	77	0.81	0.40	88	0.35	0.49	17	<i>P</i> < 0.01
Protocol for sick volunteers	32	0.29	0.46	85	0.41	0.51	17	<i>P</i> = 0.35
Accepts home-canned foods	18	0.18	0.39	88	0.13	0.34	16	<i>P</i> = 0.59
Distributes leftover prepared foods	21	0.24	0.43	88	0.00	0.00	17	<i>P</i> < 0.05
Supplier requirements	20	0.18	0.38	85	0.31	0.48	16	<i>P</i> = 0.21
Repackage food on-site	44	0.46	0.50	88	0.24	0.44	17	<i>P</i> = 0.10
Know about recalls	67	0.68	0.47	88	0.44	0.51	16	<i>P</i> = 0.06
Have recall plan	52	0.60	0.49	87	0.44	0.51	16	<i>P</i> = 0.24
Use a first-in and first-out system	81	0.84	0.37	81	0.87	0.35	15	<i>P</i> = 0.79
Distributes past-date items	64	0.67	0.47	88	0.31	0.48	16	<i>P</i> < 0.01
Written SOPs	26	0.26	0.44	88	0.18	0.39	17	<i>P</i> = 0.46

<sup>a</sup> All variables are dichotomous. Missing data are due to “don’t know” or unanswered responses.

<sup>b</sup> No food bank partner.

took part in any repacking or food handling activity were required to wear gloves.

The food banks sell to the pantries what is called “salvage,” an assortment of items at a deeply discounted rate, often past the sell-by or use-by date on the packages. Some pantries threw away past-date items, and others retained them for distribution. Of the 64 managers that explicitly stated their pantries distributed past-date items, 59 of them were food bank partners, with the difference statistically significant at the 99% confidence level. Yet, the reasons varied for doing so. Managers explained that procedures were often categorized by types of food, such as dairy and meat, and used determinations like “not long past” or “especially out of date”; they also created differentiations within a procedure for a certain product based on freezing. Twelve pantry managers were especially firm regarding the expiration date of baby food, potentially owing to the fact that infant formula specifically cannot be sold past the date on the packaging due to federal law. Overall, the managers had inconsistent information regarding the dates on food packages.

Only 63.8% of pantry managers said they had up-to-date information regarding recalls; 60 of the 67 pantries with recall information partnered with a food bank, statistically significant at the 90% confidence level. All pantries that partnered with food banks received their recall information from the food bank. Ten pantry managers assumed the food bank would remove any recalled items before distribution or that the food bank would contact them in the event of a recall, even though it had never done so. Twenty-nine managers had never pulled nor searched the pantry for a recalled product, but 13 pantry managers explicitly remembered that they had to search for or pull peanut butter during its most recent recall. Of the 52 pantries with a recall plan (which could be as simple as pulling the product and putting it in the dumpster), managers held sole responsibility for learning about contaminated items and removing them from the shelves. To elaborate, a pantry manager explained that “when the cantaloupes ‘got bad,’ they stopped giving them out.” When asked if the clients are notified in the event of

the recall, six pantry managers currently post information for clients, seven additional pantries would tell the clients if they learned of a recall (but had never done so), and 15 pantry managers responded that they would not tell the clients, either because they were unable to do so or because they made the assumption that recalled food would not reach the client. Largely, the pantry managers lack the information needed to prevent the distribution of potentially contaminated recalled food. For those who do experience a recall, there are few steps in place to remove the items or provide information to clients to do the same. Although difficult to trace, given that the pantries distribute many of the same items as the grocery stores, the lack of preventative steps can lead to the distribution of contaminated food. Similarly, even with a precedent, a new manager might not have the specifics of how to deal with a recall or foodborne illness.

Although it lacks statistical significance, only 26 pantries had written SOPs; 23 of those pantries were food bank partners. Written SOPs can provide information to volunteers if the manager is not present. Though the distribution of home-canned items is not statistically significant, it is of interest that 17.1% of pantries distributed said items. Certain foods continue to be especially risky when prepared at home; of the outbreaks caused by home-prepared foods from 1999 to 2008, 38% were caused by foodborne botulism in home-canned vegetables (10). Home-canned items can be preserved in a safe manner, though there is no way to judge their safety, if they are not labeled with the canning method or recipe or both. Many of the pantries offering home-canned items did so under the guide of “take at one’s own risk”; that is, they allowed the clients to take the products if they chose, but the products would not be put into the food boxes for direct distribution to clients. Other managers (*n* = 7) refused to distribute home-canned foods because of liability concerns.

**Additional themes established qualitatively.** In this section, the pantries are qualitatively described according to additional themes established in the interviews: liability concerns, food bank rules, and waste issues. The themes

TABLE 4. Average prevalence of particular pantry characteristics by area<sup>a</sup>

Characteristic	Total no. of pantries with characteristic	In metro area			Not in metro area			Significance
		Mean	SD	<i>n</i>	Mean	SD	<i>n</i>	
Manager food safety training	77	0.71	0.46	68	0.78	0.41	37	<i>P</i> = 0.39
Protocol for sick volunteers	32	0.28	0.45	65	0.38	0.49	37	<i>P</i> = 0.29
Accepts home-canned foods	18	0.19	0.40	68	0.14	0.35	36	<i>P</i> = 0.51
Distributes leftover prepared foods	21	0.25	0.44	68	0.11	0.31	37	<i>P</i> = 0.08
Supplier requirements	20	0.18	0.39	66	0.23	0.43	35	<i>P</i> = 0.57
Repackage food on-site	44	0.43	0.50	68	0.41	0.50	37	<i>P</i> = 0.84
Know about recalls	67	0.71	0.46	68	0.53	0.51	36	<i>P</i> = 0.07
Have recall plan	59	0.60	0.50	67	0.53	0.51	36	<i>P</i> = 0.50
Use a first-in first-out system	81	0.83	0.38	64	0.88	0.34	32	<i>P</i> = 0.55
Distributes past-date foods	64	0.59	0.50	68	0.66	0.48	36	<i>P</i> = 0.44
Written SOPs	26	0.26	0.44	68	0.22	0.42	37	<i>P</i> = 0.59

<sup>a</sup> All variables are dichotomous. Any missing data are due to “don’t know” or unanswered responses.

could be categorized as the general reasoning behind the choice of SOPs but also paternalistic influence by the food banks. The analysis provides insight into how clearer food safety guidelines might better promote risk mitigation, confirming early hypotheses on inconsistency across pantries procedures.

In the interviews, participants cited liability concerns centered on prepared foods. While more than one-quarter distribute leftover foods prepared elsewhere (from the church kitchen to a catered event to a restaurant), other managers stated that they were “conscientious not to have a deep fryer and meat slicer” due to their dangerous nature, “wouldn’t give out leftover catered or home-canned” foods or “cooked food, leftover chicken, potato salad” or “anything with mayonnaise,” and that “the food safety course made her very nervous about cross-contamination.” One manager explained that she was not “worried about contamination” because they do not “serve fresh or prepared food.” Another said, “It’s not as critical since they don’t feed people—it would be more urgent that everybody knows how to handle food.”

Intertwined with the reasoning behind the SOPs for many of the pantries was the policies established by the food bank. Of the 88 pantries that partner with a food bank, there were 49 managers who mentioned rules established by the food bank, with 85 total references. Managers indicated that the food bank determined the following: the kinds of foods they distribute (beyond what they receive from the food bank), how often they can distribute, past-date food policies, the overall SOPs, food safety training, when to pull recalled foods and what to do with them in the aftermath, client participation rules (based on address), repackaging procedures, and the rules on donations from other suppliers. Sixteen managers explained that the food bank “unexpectedly” comes to inspect their operation at the rate of one to two times per year, though they still varied in risky behavior.

Given that food pantries can be the distributors of food that would have been wasted, waste ideologies were revealed over the course of the interview. Oftentimes, these responses came as a result to a question regarding the spontaneity of donations; for example, a pantry manager

explained that “the Bush’s baked beans truck had a wreck and they didn’t want to take the cans back to Tennessee and so they were donated to the pantry.” On the other hand, the managers indicated that they did not want to throw items away (*n* = 14), but that they would in the case of bad smells, torn or broken packaging, or when it seemed generally unsuitable for consumption (e.g., mold). Six managers explained that they use “common sense” to determine the safety and quality of the food, though that method is unreliable. Although quality might be evaluated by sight, foodborne pathogens can neither be seen nor smelled. Managers were conscientious about the issues of waste and spoilage, and 52 of them stressed that concern.

**Regional differences.** Pantries in metropolitan versus micropolitan (or neither) areas were compared to evaluate pantry differences as a result of population, as rural areas have been viewed as having fewer resources and less food access than metropolitan areas (14). Two-sample *t* tests were conducted on the same characteristics as in Table 3; the comparison of metropolitan food pantries with those that lacked the designation is in Table 4. The lack of statistically significant differences based on population is notable, however, as it rejects any hypothesis that food pantries in rural areas lacked access to the same information as the urban areas or pantries’ operating procedures differed between rural and urban areas. However, the pantries in a metropolitan statistical area were more likely to know about recalls (*P* < 0.10).

**Observed food safety practices.** Another way to assess food pantry operating procedures is to evaluate the observed food handling behaviors and other food safety control measures. For these questions, the total number of pantries was 104, rather than 105; one pantry was organized as a garden that also functioned as a pantry. For this analysis, pantries were evaluated against the North Carolina Food Establishment Inspection Report. The total number of demerit points for each question is provided in Table 5. The total number of pantries for each question is varied as actions sometimes went unobserved.

TABLE 5. Point totals for Food Establishment Inspection Report questions<sup>a</sup>

Food pantry inspection question	Possible demerit points	No. of pantries observed	No. of pantries unobserved
Hands clean and properly washed	4	13	91
No barehand contact with RTE foods	3	26	19
Hand washing sinks supplied and accessible	2	104	0
Food in good condition, safe, and unadulterated	2	102	1
Food separated and protected	3	93	1
Food contact surfaces: cleaned and sanitized	3	37	10
Thermometers provided and accurate	1	82	7
Contamination prevented during food preparation, storage, and display	2	99	5
Nonfood contact surfaces clean	1	104	0
Toilet facilities: properly constructed, supplied, and cleaned	1	99	4

<sup>a</sup> The total number of pantries was 104, rather than 105, as one pantry was a garden operating as a pantry.

For certain questions based on the North Carolina Food Establishment Inspection Report, the number of pantries in which the characteristic was not observed could be just as notable as when the question was scored, as depicted in Table 5. For example, hand washing, a particularly critical action, was observed and scored in only 13 pantries; 91 pantries remained unobserved in this action. There were two kinds of instances in which that action was scored: if a person washed his or her hands; or if a person directly touched an RTE food or participated in food preparation without doing so. Given that pantry operations were only observed once and for a short period of time, hand washing could be completed but go unobserved by the researcher during the visit. In terms of barehand contact with RTE foods, 50 pantries were not distributing foods at the time that fit the category, and in 19 other pantries, the action was not observed. Due to the small sample size, the pantries were divided into two groups but not further. Two-sample *t* tests were conducted and reported on selective questions—comparing food pantries with food bank partnerships with those that lacked the partnership (Table 6) and comparing pantries that had a manager who received food safety training with those who did not have training (Table 7).

Although hand washing opportunities were rarely observed and failed to result in meaningful results, hand washing sinks were available at every pantry. Given that many food pantries operated in churches or as a part of another larger organization, pantry managers were not always responsible for the cleanliness or stocking of the bathrooms. For each of these characteristics, there lacked a statistically significant difference in pantries that did and did not partner with a food bank. Toilet facilities were “constructed, supplied, and cleaned” with few demerit points across 99 pantries and with little differences across food bank partnership (Table 6) and food safety training (Table 7).

To prevent contamination, perishable items should not be stored into the “danger zone” above 41°F (5°C), and a thermometer in the refrigerator is the most reliable way to evaluate the temperature (29). Thirty-six pantries (34.3%) lacked thermometers in each freezer and refrigerator; 10 additional managers stated that thermometers were used but were not observed by the researcher. The inability to find the thermometer in a refrigerator is similar to not having one at all, given the incapacity to use it. The use of thermometers at the pantries partnered with a food bank (*n* = 74) over an

TABLE 6. Average Food Establishment Inspection Report demerit points by food bank partnership

Inspection report question <sup>a</sup>	Total no. of pantries with characteristic	Food bank partner			Independent <sup>b</sup>			Significance
		Mean	SD	<i>n</i>	Mean	SD	<i>n</i>	
Hands clean and properly washed	13	1.64	1.75	11	3.00	1.41	2	<i>P</i> = 0.32
Hand washing sinks supplied and accessible	104	0.09	0.39	88	0.00	0.00	16	<i>P</i> = 0.36
Food in good condition, safe, and unadulterated	102	0.07	0.33	87	0.07	0.26	15	<i>P</i> = 0.98
Food separated and protected	93	0.08	0.44	84	0.00	0.00	9	<i>P</i> = 0.58
Food contact surfaces: cleaned and sanitized	37	0.35	0.77	34	0.00	0.00	3	<i>P</i> = 0.44
Thermometers provided and accurate	82	0.39	0.49	74	0.88	0.35	8	<i>P</i> < 0.01
Contamination prevented during food preparation, storage, and display	99	0.22	0.52	83	0.00	0.00	16	<i>P</i> = 0.10
Nonfood contact surfaces clean	104	0.03	0.18	88	0.00	0.00	16	<i>P</i> = 0.46
Toilet facilities: properly constructed, supplied, and cleaned	99	0.06	0.24	83	0.06	0.25	16	<i>P</i> = 0.97

<sup>a</sup> While included in Table 5, the question regarding barehand contact with food is not included on this table. The *t* tests could not be performed because all pantries scored for that question were partnered with a food bank.

<sup>b</sup> No food bank partner.

TABLE 7. Average Food Establishment Inspection Report demerit points by food safety training

Inspection report question	Total no. of pantries with characteristic	Food safety training			No training			Significance
		Mean	SD	<i>n</i>	Mean	SD	<i>n</i>	
Hands clean and properly washed	13	1.82	1.66	11	2.00	2.83	2	<i>P</i> = 0.90
No barehand contact with RTE foods	26	0.88	1.30	24	0.00	0.00	2	<i>P</i> = 0.36
Hand washing sinks supplied and accessible	104	0.08	0.36	76	0.07	0.38	28	<i>P</i> = 0.93
Food in good condition, safe, and unadulterated	102	0.04	0.26	75	0.15	0.46	27	<i>P</i> = 0.14
Food separated and protected	93	0.07	0.43	71	0.09	0.43	22	<i>P</i> = 0.84
Food contact surfaces: cleaned, and sanitized	37	0.44	0.85	27	0.00	0.00	10	<i>P</i> = 0.11
Thermometers provided and accurate	82	0.40	0.49	60	0.55	0.51	22	<i>P</i> = 0.25
Contamination prevented during food preparation, storage, and display	99	0.23	0.54	73	0.04	0.20	26	<i>P</i> = 0.08
Nonfood contact surfaces clean	104	0.03	0.16	76	0.04	0.19	28	<i>P</i> = 0.80
Toilet facilities: properly constructed, supplied, and cleaned	99	0.07	0.25	73	0.04	0.20	26	<i>P</i> = 0.59

independent operation ( $n = 8$ ) was statistically significant at the 99% confidence level.

Pantries lost points for the prevention of contamination for various reasons: refrigerated items not in a refrigerator, stacked boxes of foods on the floor, questionable foods in the same box (molding or rotting vegetables), food left outside in the heat without a cooler, and even the suggestion by the pantry manager that something needed to be thrown away for various reasons but remained in storage with the other foods. Two observations reported are only applicable to pantries that distribute perishable items: (i) food separated and protected and (ii) thermometers provided and accurate. Almost all observed pantries (95.2%) made efforts to prevent contamination during food preparation, storage, and display; 83 of the 99 pantries that did so were partnered with a food bank, statistically significant at the 90% confidence level. Generally, food was kept in an appropriate storage facility (pantry, freezer, or refrigerator) and stored with products similar to it. For example, organized pantries kept all like items together within the refrigerator. Still, more than 80% of the food pantries had no requirements for their suppliers in terms of quality, packaging, or terms of transport.

Sixteen pantry managers, without prompting, revealed that food bank employees came to inspect the pantry with some rate of regularity, usually once per year. Pantry managers also reported various standards sanctioned by their respective food banks ( $n = 49$ )—on storage, refrigeration, paperwork, use of past-date foods, food handling certification, how much food to distribute per person, food pantry geographical service boundaries, and rules for shopping at the food bank. A lack of statistically significant differences in these observations suggests that pantry managers overall are either successful or unsuccessful at certain tasks, from stocking the bathrooms to washing their hands. Food bank partnership had no significant effect in those areas.

Table 7 demonstrates that more effective food safety training is required. There lacks a statistically significant difference in all actions between pantry managers who did and did not receive training of some kind. The prevention of contamination during food preparation, storage, and display was the action that had the largest difference between pantry

managers that did and did not receive training ( $P < 0.10$ ). Furthermore, not every trained manager received the same training (i.e., curriculum) at the same frequency, which could be the reason behind the similarities of both manager types.

**Limitations.** A larger, more diverse sample of food pantries would reduce threats to internal validity. Generalizability remains a concern, given that all pantries were located within North Carolina and in only 12% of its counties. The results allow for extrapolation to other, similar counties within the state, though there will be limitations on doing so to other states, given that their supply chains and regulations on food banks and pantries (especially in terms of donation) are likely to differ. This data only provides a “snapshot” of the pantries; that is, only one event has been recorded for each pantry. The volunteers (and thus, the practices) varied week to week, month to month, or at whatever rate the pantry operates. Additionally, given that the managers knew the study’s focus was on food safety, it is possible that they responded with the answers they thought the interviewer might want to hear, rather than what was true. Yet, based on observed actions, there was little indication that responses did not correspond with the action, given that most visits occurred while the food pantry was open and distributing food ( $n = 70$ ).

## DISCUSSION

The results of this study demonstrate that, even with many positive behaviors, there remains much room for improvement in terms of food safety training and supporting resources. It adds to the current literature by addressing the differences in food pantry operating procedures, in terms of differences between independent pantries and those partnered with a food bank, metropolitan versus rural, and pantries in which the managers did and did not receive any food safety training. Individuals who receive the foods from the pantries are food-insecure, and inadequate procedures for protecting the safety of food could put this population at risk of foodborne illness without operational change.

The Centers for Disease Control and Prevention estimated that washing hands with soap water can reduce



diarrheal illness in people with weakened immune systems by 58% and the number of people who become sick by 31% (4). Given its importance, hand washing should be a regular action for all pantry participants and is potentially easy to implement task given the regularity of well-stocked and available bathrooms. Furthermore, pantries would reduce the risk of foodborne illness by obtaining more regular information on recalls, creating strict rules for what foods they will and will not distribute (e.g., home processed and past date), and having set procedures on repackaging items, from glove use to packaging and labeling. While the managers use the package dates as guides for some foods, including meat, they use visual inspection to analyze bread and pastries. Although some of the pantry managers had readily available information for their volunteers to decipher “how long is too long,” it was inconsistent across both regions and partnerships. There remains an incorrect association between the package dates and safety, rather than quality. While many expressed the same sentiment, it was best illustrated by the pantry manager who explained, “no one wants old meat.”

That most pantry managers lacked information on food recalls is a public health failure. Although many of the food banks e-mail regular briefings on recalled items to pantries, the provision of that information is variable among regions, leaving the pantry managers to independently find and dispense any recall information, as well as dispose of the recalled items or notify the clients. This research found that few managers have taken that initiative or even realized that they should do so. Individuals and organizations should be able to easily obtain information from the U.S. Food and Drug Administration, given that the agency has the authority and means to distribute it in a methodical way, and the managers should know to seek out said information.

Food pantry volunteers and managers might not actualize a task if they do not fully recognize its importance, as shown in the food pantries where the thermometers are rarely read nor recorded. Therefore, a simple, easy-to-access set of guidelines to explain the importance of such actions would benefit the members of the food pantry community, both those who partner with a food bank and those who are independent. Written SOPs would allow for the manager to answer each question once, as well as provide agency for volunteers to learn the answers to questions regarding how and why things are done. Even more, tracking information, such as refrigerator temperatures and sources of food, allow for backward induction in the event that a client does become sick from the food, as then the products are traceable and questionable procedures can be identified. Overall, new tools, procedures, or policy interventions might prove to be more effective than the curriculum or format currently in use, because the information in the food safety trainings has not fully been actualized by its participants.

Finally, further research could add to the richness of this new field by incorporating details on the emergency food supply chain and food acquisition practices centered on food-insecure populations. The research regarding emergency food operations is far from complete.

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