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Virginia Food Bank Employees' Food Safety Education Experiences, Challenges, and Needs

ABSTRACT

Regional food banks train employee and volunteer food handlers to distribute food. While previous research has identified that hunger-relief food handlers increase their knowledge of safe food handling after participating in trainings, hunger-relief food handlers have also been observed improperly handling food. Based on Keller's Attitude, Relevance, Confidence, and Satisfaction Model of Motivational Design, trainings and materials which align with the motivations of food handlers could improve the translation of knowledge to behavior. Interviews were conducted with representatives from three of Virginia's regional food banks to determine their perceptions of safe food handling education, unique food safety challenges to inform novel educational materials, and motivations for service. Participants expressed that food safety education should be contextualized specific to how the food handler is expected to handle food. They described how a food handler's pre-existing beliefs and food handling behaviors can, at times, conflict with how they are expected to handle food. Their interviews identified that food safety

trainings could be delivered through multiple mediums to capture and maintain attention, provide role-specific and relevant information, utilize problem-solving scenarios to develop confidence, and promote satisfaction by offering rewards to participants.

INTRODUCTION

Food recovery organizations (FROs), such as regional food banks, local food pantries, and meal kitchens in the United States (U.S.) work to meet the hunger-related needs of the estimated 13.5% of U.S. households which experience food insecurity (19, 34, 40). People who have experienced food insecurity exhibit higher than average rates of chronic diseases, lower self-care capacity, and insufficient access to healthcare than people who experience food security (4, 10, 16, 22, 45). While the number of foodborne illnesses resulting from consuming recovered food is unknown, it is reasonable to expect that contracting a foodborne illness could exacerbate any pre-existing health conditions and contributing factors for experiencing food insecurity.

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The primary function of food banks is to distribute large quantities of food to local organizations that offer it to people in their community experiencing hunger (20, 34). Feeding America, a U.S. network of food banks, provides technical support, access to food, and advocacy for their 200 affiliated food banks and 60,000 partner agencies (19). It is not known how many programs in the U.S. operate outside of the Feeding America network (11).

Food banks are included in the definition of food establishments in the U.S. Food and Drug Administration's *Model Food Code*. The 2022 edition of the Code included, for the first time, a provision explicitly allowing retail food establishments to donate their food if "stored, prepared, [packaged], displayed, and labeled in accordance to Law and this Code," (47). Regulations pertaining to food handling in food banks and other hunger relief organizations are present in some state equivalents to varying degrees (30). To address liability concerns, the Bill Emerson Good Samaritan Food Donation Act provides federal liability protection when food is donated "in good faith," and most states have adopted similar legislation (3, 30). A requirement of FROs that accept food through governmental nutrition assistance and commodity programs, such as the Commodity Supplemental Food Program, is their compliance with relevant safe food handling and inspection requirements. The FROs that participate in this and related programs are held accountable to these standards by the administering state agency (15). In place of consistent regulatory expectations, Feeding America and regional food banks set food safety policies, coordinate third party audits, and determine food handler education requirements (18).

Risk of contracting a foodborne illness is impacted by how food has been handled prior to donation, during transport between donors and FROs, when at the FRO, and after it is received by someone (12, 13, 43). To support safe recovered food handling, the National Restaurant Association and Feeding America co-created the ServSafe® Food Handler Guide for Food Banking to provide context-specific examples of safe food handling practices presented in other ServSafe® training materials (35). Public and private entities have published guidance documents and informational factsheets designed to address safe food handling within the context of food donation, recovery, and distribution (1, 2, 5, 7, 9, 24, 25, 26, 38, 41, 48).

FRO food handlers who have participated in some kind of food safety education increase their food safety knowledge and intend to engage in safe food handling behaviors (14, 23). However, the limited research at the intersection of food safety and food recovery demonstrates that FRO food handlers display unsafe behaviors and that hunger relief organizations may not be adequately equipped to consistently handle food safely (6, 12, 43). Additional resources or updated training content and delivery may be necessary for knowledge and positive intent to translate to practice.

The work of this project, which was to measure the experiences, beliefs, and motivations of food bank employees pertaining to food safety and food safety education, was guided by the following research questions:

- What motivates the work of employees who have responsibility for food safety in Virginia's food banks?
- How have employees with responsibility for food safety in Virginia's food banks experienced food safety education?
- How do employees with responsibility for food safety in Virginia's food banks perceive food safety education?

Conveying material in a way that resonates with the motivations of trainees promotes desired behavior change (8, 31, 32, 33). This project is situated in the Attention, Relevance, Confidence, Satisfaction Model of Motivational Design (ARCS Model), which states a training should gain the attention of the audience, deliver relevant material, promote participant's confidence with the material, and generate satisfaction to promote learning and prompt desired changes in behavior (27, 28). Research detailing experiences and perceptions of safe food handling have included motivational factors in the development of educational and systemic recommendations (17, 21, 46). This has not yet been studied in the context of food recovery food handlers.

MATERIALS AND METHODS

All parts of this study were approved by the Virginia Tech Institutional Review Board (VT IRB 19-321).

Target audience. Participation in this project was limited to the individual(s) with responsibility for food safety in each of Virginia's seven Feeding America-affiliated regional food banks. We expected these individuals would be able to discuss how food handling policies were enacted and detail the necessary trainings for food handlers affiliated with the food bank.

Recruitment. We requested the names and contact information of individual(s) responsible for food safety at each of Virginia's regional food banks from Feeding America. This request did not include specific position titles, rather position responsibilities as each food bank may classify that person differently. We received a name, title, e-mail address, and phone number of the individuals to contact with food safety-related inquiries. We sent individual recruitment e-mails to request participation with information about the project and consent information. If there was no response to the recruitment e-mail, we followed-up with a phone call.

Pre-interview surveys. Interested individuals were asked to complete an eligibility survey to confirm their contact information, if they consented to participate in this project, and if they self-identified as being responsible for food safety at their food bank. If they were, they were eligible to move forward with the project. If they did not, they were asked to share the name and contact information for a colleague they believed would be eligible.

TABLE 1. Semi-structured interview questions**Questions**

1. Why is food safety important for the work of your organization?
2. What challenges your organizations' ability to handle food safely?
 - a. At what stage is food safety the most significant concern for you? This could be, and is not limited to, volunteer turnover, food storage (dry and cold), where the food is coming from, as well as when/how it is distributed.
3. How are food handlers trained in your organization to handle food safely.
 - a. How does that happen?
 - b. Who leads it? How does it compare to your training, and why?
4. Please describe how your work intersects with your local partner agencies.
 - a. What support have you provided them? What materials or other resources have you used? Their sources? Can you share them?
 - b. What support have you been asked to provide but have been unable to do? Why?
5. Please describe how you navigate your responsibilities to your food bank and your local partner agencies?
6. What challenges have you experienced when working with your partner agencies?
 - a. Any barriers?
7. Based on your past experiences with food recovery, what would you want in an ideal food safety training program that you or your partner agencies could use?
 - a. What topics would you keep or modify?
 - b. How would you want that training organized? For example, in-person or online? Full-day or half-day? Through Virginia Cooperative Extension, a private trainer, your regional food bank, etc.?
8. Primarily with food safety, but also in other ways, please describe your relationship with the following groups:
 - a. Virginia Cooperative Extension
 - b. Virginia Department of Health
 - c. Virginia Department of Agriculture and Consumer Services
 - d. Feeding America
 - e. Other regional food bank
9. What would your ideal relationship be with these groups in how they support food safety in your organization? As a reminder, these include:
 - a. Virginia Cooperative Extension
 - b. Virginia Department of Health
 - c. Virginia Department of Agriculture and Consumer Services
 - d. Feeding America
 - e. Other regional food bank
10. How does food safety impact the amount of food you discard in your organization? What else impacts the amount of food you discard?
11. What motivates you to continue serving with your organization?
12. In light of everything that we have discussed so far today, is there anything you would like to add that we may have missed?

If eligible they were sent a second survey before the interview to collect personal (age, gender identity, completed formal education, and race/ethnicity) and organizational (who serves as food handlers within the food bank, how food handlers are trained, how food is handled, their work and responsibility for food safety, and food safety-related training experiences) data. All questions were optional. Surveys were administered electronically using Qualtrics (Qualtrics, Provo, UT) and consent was implied if the participant submitted a response to the survey.

Interviews. Interviews took place between October and December 2019, and were conducted either in-person or using Zoom (Zoom, San Jose, CA) based on the location of the food bank in relation to the research team. All interviews were conducted by the same member of the research team with an additional notetaker. Consent was obtained in-writing prior to participation in the interview. The interviews were semi-structured, with a series of 12 pre-determined questions with flexibility to ask follow-up questions as needed at a conversational pace (Table 1) (39). The interview questions were reviewed by a panel of experts for face validity and revised for the first interview. Data collected after the first interview was reviewed again to determine if any edits needed to be made to the interview questions before the subsequent interviews; no edits were made. The interviews were designed to take between 60 and 90 minutes. Each interview was recorded using a Sony (Sony, Tokyo, Japan) voice recorder, the built-in Zoom (Zoom, San Jose, CA) recording function (when applicable), and the iPhone Voice Memos application (Apple, Cupertino, CA). The recording was used to develop a verbatim transcript through Otter.AI (Otter.AI, Los Altos, CA), which was edited for accuracy, clarity, and grammar.

Data analysis. Quantitative data collected through the surveys were analyzed using descriptive statistics in Microsoft Excel (Microsoft, Redmond, WA). Qualitative data collected through interviews were initially analyzed using an open, inductive coding scheme (39). One interview transcript was coded independently by two members of the research team. Their individual codebooks were compared and refined to develop a single codebook which was used to independently analyze the remaining transcripts. The coders modified the combined codebook by consensus when additional codes from the remaining transcripts were created, meaning a new code was only included when the two coders were in agreement (42). Analytical memos were written to summarize each interview, organize codes into categories, and further refined for consensus between the coders (39, 42). Categories were then analyzed using the ARCS Model to determine how interviewee's perceptions and experiences could inform future food safety education and support, centered in the motivation of food handlers (27, 28). This process was completed using GoogleDocs, Microsoft Word, and Microsoft Excel (Google, Mountain View, CA; Microsoft, Redmond, WA).

RESULTS

Five individuals from five out of seven of Virginia's food banks completed the eligibility survey. Three of them consented to an interview (43%), and their experience and educational backgrounds are described in Table 2. The results presented here include context into the operations of these three food banks in addition to data analyzed using the ARCS Model (27, 28).

Sources of food. Three broad categories of foods were described as being handled by the food bank: 1) food purchased from manufacturers or retailers at a discounted price; 2) food donated by an individual, manufacturer, processor, retailer, distributor, or civic organization, and 3) food sourced through government nutrition assistance or commodity programs. One portion of donated foods was referred to as "salvage," by which the food bank acted as a receiving and distribution center for unsold food from a regional grocery store chain.

Food handling. The flow of food within the food banks represented in this project is detailed in Figure 1. Food handlers within the food banks were a combination of paid full- and part-time employees as well as volunteers. Food handlers worked as part of the pick-up/receiving process, inspecting, sorting, and storing foods, as well as distributing foods. Some foods would be distributed directly by the food bank, such as through a mobile pantry program which serves areas of their region not served by a partner agency. In addition to serving humans, two food banks described partnerships with pig farmers that took food they could not distribute but was still fit for animal consumption.

The importance of food safety. Each participant stressed that maintaining food safety was a way of protecting the ultimate recipient of the food, with one participant explaining, "Just because we're a food bank, and we're giving away free food, doesn't mean we want to give anyone anything that's going to make them sick." Another described:

[T]he biggest reason that food safety is important is because, you know, we're distributing food to people in need...20% of our clients are seniors [and] 33% are children, so they're very vulnerable to foodborne illness. [T]he last thing we want to do is makes anybody sick while we're trying to help.

Food safety was also described as a way for the food bank to manage its risk and public perception. There was an acknowledgement that while they do not believe they would be liable, the public perception of a foodborne illness outbreak coming from food they distributed could cast a negative perception on their operations. One participant described their belief that this would impact their ability to receive donations and for people to feel comfortable to receive food through their network:

Even if you've done nothing wrong, you could still get sued and in the days of social media it becomes very visible. The food bank gets sued [and] that's going to be all over

TABLE 2. Participant demographic information

Participant	Length of service (years)	Food safety certifications	Highest level of completed education
1	5–10	ServSafe® Food Handler ServSafe® Manager ServSafe® Food Handler for Food Banking	Associate's Degree
2	10–20	ServSafe® Food Handler ServSafe® Manager ServSafe® Food Handler for Food Banking Serving Food to the Public ^a	Bachelor's Degree
3	5–10	ServSafe® Food Handler ServSafe® Manager ServSafe® Food Handler for Food Banking	Bachelor's Degree

^aA program offered through Cooperative Extension

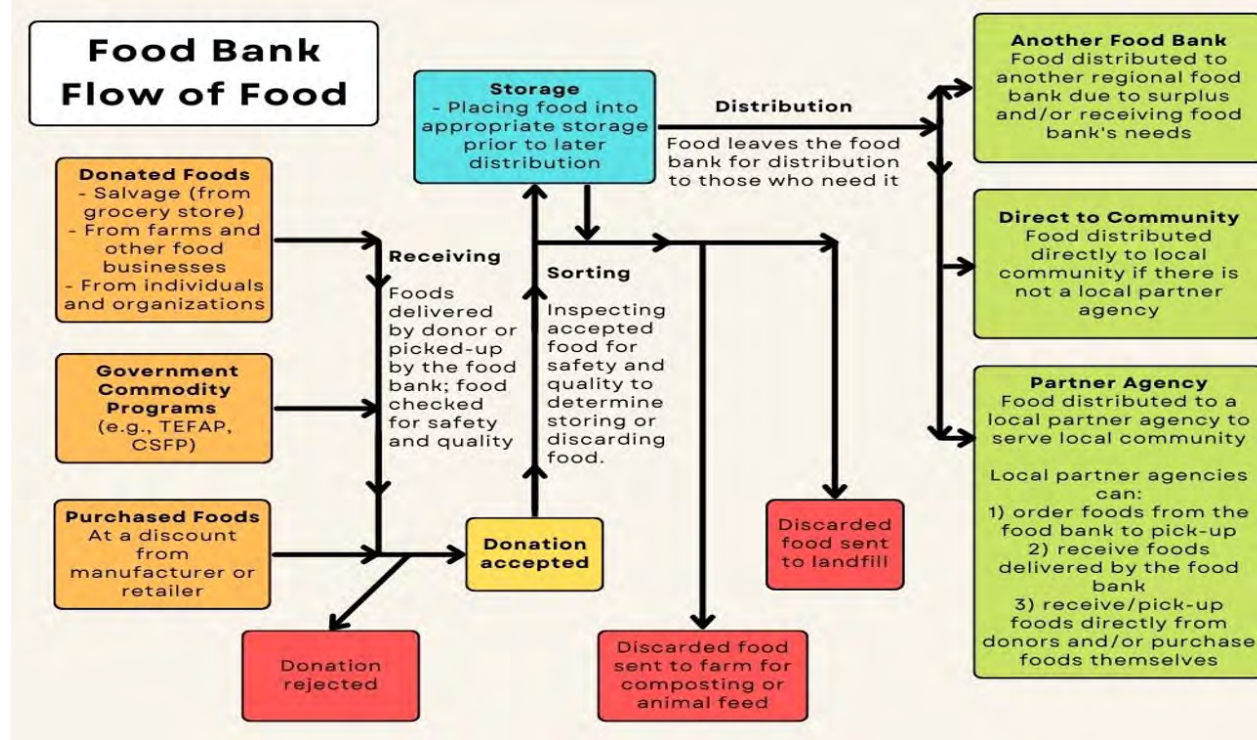


Figure 1. A diagram demonstrating the flow of food within the food banks interviewed for this project, from receiving to distribution and including the points at which food is discarded.

Facebook, and Instagram, and Snapchat. Even if we've done nothing wrong, the optics of it are just terrible.

Food safety education requirements. Food safety education was something those interviewed described as being required by the food bank for food handlers to serve; that it was part of the onboarding process and offered through continuing education. The specific trainings was dependent upon a person's role within the food bank. For example, a volunteer may view a food bank-produced video whereas a warehouse employee might also complete the ServSafe® Food Handler and/or Food Handler for Food Banking training (35, 36). Employees with additional responsibility and oversight might also complete the ServSafe® Food Handler Certified Food Protection Manager certification (37). In addition to training at regular intervals to remain certified (as applicable), mini-trainings or refreshers were described as being offered throughout the year to employees. One participant offered current Good Manufacturing Practices refreshers and incorporated food safety information into morning meetings of food bank food handlers, for example how to inspect food packages for signs of contamination and/or damage.

Food safety education challenges. Each participant discussed managing their food handlers' pre-existing knowledge and beliefs; that those beliefs were at times incongruent with currently available best practices and expectations. They also described challenges when applicable regulations or expectations change over time, for example when there are updates to the FDA Model Food Code. One participant described:

As far as some new regs that come down or new ways to do things, sometimes they'll say, "[I've] worked at the food bank for 20 years." "I worked at the food bank [for] forever. We never had to do that before." "Why do we have to do this now?" "We've always gotten by just fine doing it the old-fashioned way."

Finding time for an employee to complete training often conflicted with other job responsibilities. For example, warehouse employees go through training and at the same time a donor arrives with food that needs to be sorted and stored. The priority for the employees became taking care of the food and coming back to the training when possible.

Additional challenges. Those interviewed described receiving low quality and/or potentially unsafe food from well-intentioned donors. For example, when receiving a delivery of food one participant explained, "[T]hey'll have a load of cantaloupes for us. Been more than once when we go to look at it and look in there, it's nothing but gnats." This was challenging not only to the food bank, who would either need to accept and sort the food or discard it, but also potentially create conflict with the donor. There is concern that conflict within their relationship could lead the donor to no longer donate or deliver food to the food bank.

In another, a participant described receiving food packaged by donors in a way that potentially allows cross-contact and/

or cross-contamination to occur, and resulted in discarding the entire donation:

[S]ometimes they're like "Well I only have one box, so let me just throw this in there." And they should know that we don't accept fish from the deli. That... shouldn't have even gone in there, especially sushi which is not cooked.

The food banks described not always having the adequate equipment to safely store foods which could be made available to them because they require specific storage conditions, for example not taking foods which require cold-storage due to a lack of refrigerators. Working within non-profit organizations, those interviewed described being unable to make updates as quickly or efficiently as in the for-profit food industry:

[W]e basically run on the kindness of others both through money and food. This particular facility is about 60 years old. In an older building like that, there's always something that needs to be fixed... and the money piece always factors in.

Food bank food handlers were challenged when partner agencies have come to pick-up food without the necessary equipment:

I've had agencies telling me that, "I can go shopping for my family at Food Lion and nobody makes me, you know, put it in an ice cooler or whatever. I can feed my family by throwing the meat in the backseat and driving a half hour home." They don't get why and basically, [I've] said, "Well, if you feed your family that, there's nothing that I could do about that. But if you come as an agency and get food from us, we are still liable for the food safety part of it."

Ideal training. Interviewees expressed that food safety information should be embedded in a food handlers broader training, not only offered in separate training. For example, a volunteer who is helping receive and sort food should know how to do that, with one component being relevant safety information. Specific topics that were identified for inclusion in this training include:

- Time and temperature control for safety;
- Interpreting use-by/best-by/sell-by dates and applying that information in food recovery;
- Safe storage of food relative to cleaning chemicals;
- Food allergens;
- Navigating relationships with food donors;
- Liability protection;
- How their work can inform public perception; and,
- Problem-solving techniques for when something inevitably challenges their operations.

Those interviewed expressed that the training content needs to be context- and role-specific; a one-time volunteer does not need the same level of information as someone with a more significant level of responsibility. Similarly, food handlers serving within a mobile pantry program may need different information than those receiving and sorting foods at a central facility. One suggestion to address these differences was by offering case-studies or vignettes which

represent the role of the person being trained for trainees to work through.

Those interviewed offered mixed perspectives on how a training could be delivered. Some believed that training should take place online, while others believed it should be in-person. There was also a difference between those who believed that training should be coordinated and offered by the food bank or independently through an external organization (e.g., Cooperative Extension). There was agreement that training should take place on a regular basis, depending on the role of the food handler. The required length of time for training was also perceived to be role-dependent, with a volunteer only taking a short training before their service while managers train for a day or longer. One participant expressed:

... [L]et's say you're a quality manager, I think multiple days are fine. If you are coming out of the warehouse and sitting down for more than a day, I think you're lost in the fog. A shorter period of time [is] more effective. I think it depends on the position, quite frankly, and who you are.

Motivations for service. When asked why they continue to serve with their food bank, each participant expressed some connection to the broader cause of making food available and addressing food insecurity in their community. In addition to describing it as a humbling process, they described a sense of altruism. Specifically, one participant shared, "Somebody is going to have a meal tonight because I came to work, even if I didn't physically feed somebody, you know, my job is to make sure people that are in our community have a meal tonight." One participant went as far as to share their belief that they were "born to be a food banker."

DISCUSSION

The data we collected allows us to answer the original three research questions and go beyond them to further describe food handling and food safety education in FROs. This adds to the preexisting literature by identifying context-specific food handling challenges, food safety education needs, and motivations of recovered food handlers. This discussion will focus on how the experiences and perceptions of those interviewed can be used to inform an updated food safety education curriculum using the ARCS Model for Motivational Design (27, 28). A summary of recommendations based on the study findings can be found in [Table 3](#).

Addressing attention in future food safety education. An educational training must be able to obtain and maintain the attention of learners. Doing this requires the training to spark their curiosity so they also develop their own questions which can be answered through their continued participation in the training (27, 28). Designing a training with intentional variety in how material is presented can help do this, for example offering a combination of written

and audio/visual materials (27, 28). Continuing education and reinforcement of material covered in training could occur through strategically placed posters throughout the food bank, designed to promote specific safe food handling behaviors such as handwashing (44). Those interviewed expressed that maintaining the attention of their food handlers can be a challenge as a result of the amount of time needed to complete the food safety training competing with other job responsibilities, a challenge present in other food handling contexts (46). As a result, food safety training could be designed to be customizable to be offered all-at-once or in smaller segments as well as online, in-person, or some hybrid. A food handler and their supervisor could together identify which of the options best aligns with their capacity and responsibilities.

When sparking curiosity, it is important to frame topics as problems to be solved through new knowledge (27, 28). The training could be framed as addressing unsafe food handling, which could lead to a foodborne illness that exacerbates the circumstances that lead a client to experiencing food insecurity. Trainees could be motivated to complete the training, so they are best equipped to handle foods safely and protect their clients.

Addressing relevance in future food safety education. Promoting relevance in an educational training requires the integration of three strategies: relating the material to specific goals; connecting the material to the interests of the learners; and matching the material to the experiences of the learners (27, 28). Those interviewed shared that there is a need for role-specific training, which they already offer by having single-day volunteers going through a different training than full-time employees. There were additional distinctions based on the expected type of food handling – the difference between food handlers who will only handle shelf-stable products compared to those handling refrigerated, frozen, or prepared foods. They also described conflict learners' experience with the material, as documented in other food handling contexts – that they handle food differently in their personal lives or have handled food differently in past service without consequences (46).

Trainings could be designed to begin with specifying the learning goals and objectives with trainees, and also allowing them to define their own goals. These goals could be focused on how the information presented can influence their food handling behaviors in the short- and long-term as it relates to their role. Their sense of relevance would be supported by using role-specific examples and case-studies for them to work through. The novel training can also be designed to address food handler's pre-existing beliefs and highlight the differences in responsibility and impact between handling food for themselves compared to others (46).

Addressing confidence in future food safety education. It is necessary for training to instill confidence in the learner's ability to take action with the information conveyed to

TABLE 3. Summary of how food safety education trainings for FROs can be informed using the ARCS Model

Theme	Key components	Food bank challenges	Opportunities
Attention	Attracting, sustaining, and targeting the focus of a learner	Trainings being interrupted by unexpected, time-sensitive, work-related tasks (e.g., accepting a delivery)	Offering material in multiple formats Aligning training length with expected service Framing the training to address unsafe food handling as problem which can be solved through additional knowledge
Relevance	Aligning the material conveyed and instructional design with the needs of the learners	Food handlers being trained and expected to handle in their service differently than they handle food in their personal lives	Aligning training topics with expected service Identifying the differences in responsibility between handling food for themselves compared to others Allowing trainees to set individual goals for participation
Confidence	Supporting the learner's belief that they can successfully act with new knowledge	Being unable to practice food handling expectations prior to service	Prompting trainees complete a set of problem-solving scenarios Allowing trainees to develop their own problem-solving scenarios Completing a knowledge-based assessment
Satisfaction	Intrinsic and extrinsic rewards which reinforce learning and successful action based on new knowledge	Food handlers deciding between allowing an improperly equipped partner agency to take food, or denying them the food for further distribution	Acknowledging accomplishments through rewards Offering additional resources for review post-training Inform training with equipment available so trainees can translate knowledge to action

promote a sense of control (27, 28). The training should set clear expectations for success, provide opportunities for learners to be successful, and demonstrate how their success is a result of their experience and knowledge as opposed to success being a result of chance (27, 28). Important in the process of developing confidence is to allow the learners to critically analyze their experience and be allowed to offer feedback to further develop and improve the training (27, 28).

Those interviewed described that some food handlers go through a ServSafe® food handling training (35, 36, 37). Highlighting learners successfully completing one of their trainings, thereby demonstrating competency, is one way to instill confidence. It is unclear if in-house trainings designed for volunteers include any type of assessment; if not, they

could for this purpose. Additional forms of confidence-building could include completing a set of problem-solving scenarios based on how a food handler is expected to handle food. Trainees who have previously handled food within a food bank could also design their own problem-solving scenarios from their past experiences which can then be addressed through their new knowledge. In showing competency that way, trainees could also begin developing a stronger sense of personal control. These new scenarios could also be collected and included in future trainings.

Addressing satisfaction in future food safety education. The training needs to promote intrinsic satisfaction and offer extrinsic incentives; learners need to be equitably held accountable to what they have learned (27, 28). The training should be designed so that the instructor is able to offer

positive, constructive feedback that reinforces their change in knowledge or behavior. The training should also include additional resources that trainees can seek out on their own to sustain their curiosity and empower them to problem solve.

Learners should experience some kind of external motivation (such as rewards), positive individualized attention, or other ways to recognize their accomplishments (27, 28). Successful completion of ServSafe® related trainings convey a certificate (35, 36, 37). If a training is tied to some external research or evaluation, trainees could be offered a gift card or other monetary incentive. Alternatively, trainees could be asked how they would prefer to be recognized for their success and allocate resources accordingly.

Lastly, there should be equity in how rewards are offered and how learners can be held accountable to the knowledge of safely handling and distributing food (27, 28). For example, some employees of a food bank allow partner agencies to receive food without the proper equipment while others do not. One way to promote equity and develop satisfaction with enacting their knowledge could be to pair education with equipment they can use in these scenarios. In this case, the food handler would not be in the position to have to deny a partner agency food, in line with their training, at the expense of making food available, in line with their motivations for service.

CONCLUSIONS AND RECOMMENDATIONS

Food recovery food handlers engage in meaningful work with the goal of increasing access to food for people experiencing hunger. These food handlers, volunteers and employees alike, come into their role with preconceived beliefs and engrained behaviors which can at times conflict with the expectations of the FRO they are serving. These FRO food handlers also require customized education due to the unique way they receive, sort, and distribute food as well as working with volunteers who naturally turnover and are only available for a limited amount of time.

Incorporating food safety education in a way that addresses the motivations of individual food handlers could increase knowledge and increase the translation of that knowledge into practice. Food safety educators can do this by framing food handling as a problem that can be solved and offering training content in a variety of formats to capture and

retain attention. Training should focus on the information that is going to be relevant to that food handler. Trainees should be given the opportunity to develop confidence in their knowledge by working through case studies or vignettes. Finally, they should be given some kind of external recognition and be properly equipped to put the information into action so they experience satisfaction with their training.

Limitations. This research is based on the perceptions of those interviewed and how they recall their experiences – it is not meant to represent observed behaviors and experiences of all food handlers within their or other food banks. This research could be influenced by social-desirability biases, in which those interviewed attempt to portray themselves and their organization in a way that is considered acceptable as opposed to what they actually believe or recall. Lastly, this manuscript conveys perceptions and descriptions collected before the COVID-19 global pandemic, and it is unknown if or how perceptions and food handling behaviors are different in the current climate.

Future research and practice. This research represents the experiences of employees from three of Virginia's seven regional Feeding America food banks, and this project could be replicated in other U.S. states or countries to determine the reproducibility of our results. Observational assessments could be conducted of the educational activities coordinated by the regional food banks and content analysis of the materials they use. Similar work could also take place with food bank partner agencies and/or organizations unaffiliated with formal food banking networks, such as through focus groups, additional in-depth interviews, and/or a survey. Any novel educational trainings developed for use within the context of food banking could also be evaluated to determine its ability to change knowledge and impact on food handling behaviors. Lastly, additional interviews could be conducted to determine how food handling within the context of food banks and trainings have changed, using our results for comparison, as a result of the COVID-19 pandemic.

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REFERENCES

1. Association of Food and Drug Officials. 2017. Food Sorting Guidance and Model Consumer Commodity Salvage Code. Available at https://www.afdo.org/wp-content/uploads/2020/11/Food_Sorting_Guidance_and_Model_Consumer_Commodity_Salvage_Code_acc_updated_2017.pdf. Accessed 3 March 2025.
2. Association of Food and Drug Officials. 2019. Bulk Repacking of Non-ready-to-eat Dry Product For Charitable Distribution Guidance Document. Available at https://www.afdo.org/wp-content/uploads/2020/11/Bulk_Repacking_of_Non-ready-to-eat_Dry_Product_For_Charitable_Distribution_Guidance_Document_acc_updated_2019.pdf. Accessed 3 March 2025.
3. Bill Emerson Good Samaritan Food Donation Act. 42 U.S.C. § 1791 (2023).
4. Boswell Dean, E., M. French, and K. Mortensen. 2020. Food insecurity, health care utilization, and health care expenditures. *Health Serv. Res.* 55 (Suppl 2): 883–893.
5. Canto, A., B. Ingham, S. Larson, J. Park-Mroch, and J. Gauley. 2018. Safe and Healthy Food Pantries Project. Available at <http://fyi.uwex.edu/safehealthypantries>. Accessed 3 March 2025.

6. Chaifetz, A. and B. Chapman. 2015. Evaluating North Carolina food pantry food safety-related operating procedures. *J. Food Prot.* 78:2033–2042.
7. Christian, C. and K. Levine. 2020. Food Pantries and Food Banks. Available at <https://foodsafety.ces.ncsu.edu/community-food-safety-resources/food-pantries-and-food-banks/>. Accessed 3 March 2025.
8. Clegg, D. O. 1967. Motivation theory in practice. *J. Coop. Ext.* 5(Spring): 23–29.
9. Conference for Food Protection. 2021. Comprehensive Resource for Food Recovery Programs. <http://www.foodprotect.org/guides-documents/comprehensive-guidance-for-food-recovery-programs/>. Accessed 3 March 2025.
10. Cook, J. T., D.A. Frank, C. Berkowitz, M.M. Black, P.H. Casey, D.B. Cutts, A.F. Meyers, N. Zaldivar, A. Skalicky, S. Levenson, T. Heeren, and M. Nord. 2004. Food insecurity is associated with adverse health outcomes among human infants and toddlers. *Community Int. Nutr.* 134(6):1432–1438.
11. Craig, S. and M. Baum, 2020. Food Recovery Committee Report. Conference for Food Protection. Available at http://www.foodprotect.org/issues/packets/2020Packet/issues/I_001.html. Accessed 3 March 2025.
12. Davis, L.B., I. Sengul, J.S. Ivy, L.G. Brock, and L. Miles. 2014. Scheduling food bank collections and deliveries to ensure food safety and improve access. *Socio-Econ. Plan. Sci.* 48(3):175–188.
13. de Boeck, E., L. Jaxsens, H. Goubert, and M. Uyttendaele. 2017. Ensuring food safety in food donations: Case study of the Belgian donation/acceptation chain. *Food Res. Int.* 100(2):137–149.
14. Dean, K.W., E.S. Reames, G. Tuuri, and M.J. Keenan. 2008. Improved knowledge and adoption of recommended food safety practices by food recovery agency personnel and volunteers participating in the serving food safely program. *J. Ext.* 46(4).
15. Donation of Food in the United States, Its Territories and Possessions, and Areas Under Its Jurisdiction. 7 C.F.R. § 250 (2016).
16. Dutta, M.J., A. Anaele, and C. Jones. 2013. Voices of hunger: Addressing health disparities through the culture-centered approach. *J. Commun.* 63(1):159–180.
17. Edwards, Z., M. Edlefsen, V. Hillers, and S.M. McCurdy. 2005. Evaluation of a teaching kit for family and consumer science classrooms: motivating students to use a food thermometer with small cuts of meat. *J. Food Sci. Educ.* 4(3):47–52.
18. Feeding America. (2025a). *Ensuring Food Safety*. <http://www.feedingamerica.org/our-work/our-approach/ensure-food-safety.html>. Accessed 3 March 2025.
19. Feeding America. (2025b). *Feeding America Network*. <https://www.feedingamerica.org/our-work/food-bank-network>. Accessed 14 March 2024.
20. Feeding America. (2025c). *Our Work*. <http://www.feedingamerica.org/our-work/>. Accessed 3 March 2025.
21. Feng, Y. and C.M. Bruhn. 2019. Motivators and barriers to cooking and refrigerator thermometer use among consumers and food workers: A review. *J. Food Prot.* 82(1):128–150.
22. Fiese, B. H., B.D. Koester, and E. Waxman. 2014. Balancing household needs: The non-food needs of food pantry clients and their implications for program planning. *J. Fam. Econ. Issues*, 35(3):423–431.
23. Finch, C. and E. Daniel. 2005. Food safety knowledge and behavior of emergency food relief organization workers: Effects of food safety training intervention. *J. Environ. Health* 67(9):30–34.
24. Hamilton, A. 2019. 8 Tips for Donating Food to Food Banks and Pantries. University of New Hampshire Extension. Available at <https://extension.unh.edu/resource/8-tips-donating-food-food-banks-and-pantries>. Accessed 3 March 2025.
25. Hedstrom, N. and K. Yerza. 2011. Food for ME: Food Safety for Food-Pantry Donations. University of Maine Extension. Available at <https://extension.umaine.edu/publications/4302e/>. Accessed 3 March 2025.
26. Ingham, B. 2021. Safe Produce for Food Pantries. The University of Wisconsin-Madison. Available at: <https://www.ksre.k-state.edu/foodsafety/topics/doc/safeproducefoodpantryMSU.pdf>. Accessed 3 March 2025.
27. Keller, J. M. 1987. Development and use of the ARCS model of instructional design. *J. Instr. Dev.* 10(3):2–10.
28. Keller, J. M. 2010. *Motivational Design for Learning and Performance: The ARCS Approach* Springer US, New York, NY.
29. Leal, A., J. Rumble, and A. Lamm. 2017. Using critical thinking styles to inform food safety behavior communication campaigns. *J. Appl. Commun.* 101(2):19–32.
30. Leib, E. B., A. Chan, A. Hua, A. Nielsen, and K. Sandson. 2018. Food Safety Regulations and Guidance for Food Donations: A Fifty-State Survey of State Practices. Harvard Food Law and Policy Clinic. Available at https://www.chlpi.org/wp-content/uploads/2013/12/50-State-Food-Regs_March-2018_V2.pdf. Accessed 3 March 2025.
31. Lewis, R. B. 1972. Motivation Model for Extension. *J. Ext.* 10(Winter): 23–34.
32. Li, K. and J.M. Keller. 2018. Use of the ARCS model in education: A literature review. *Comput. Educ.* 122:54–62.
33. Lindner, J. R. 1998. Understanding Employee Motivation. *J. Ext.* 36(3).
34. Mousa, T.Y. and J.H. Freeland-Graves. 2017. Organizations of food redistribution and rescue. *Public Health.* 152:117–122.
35. National Restaurant Association Educational Foundation. 2014. *ServSafe Food Handler Guide for Food Banking* (First ed.). National Restaurant Association Educational Foundation, Chicago, IL.
36. National Restaurant Association Educational Foundation. 2024a. *ServSafe Food Handler Guide* (Sixth Revised ed.). National Restaurant Association Educational Foundation, Chicago, IL.
37. National Restaurant Association Educational Foundation. 2024b. *ServSafe Manager* (Seventh Revised ed.). National Restaurant Association Educational Foundation, Chicago, IL.
38. Nwadike, L. 2018. Donating Safe and Nutritious Food to Food Pantries and Soup Kitchens. K-State Research and Extension. Available at <https://bookstore.ksre.ksu.edu/pubs/MF3352.pdf>. Accessed 3 March 2025.
39. Patton, M. Q. 2015. *Qualitative Research and Evaluation Methods* (Fourth ed.). SAGE Publications, Inc., Los Angeles, CA.
40. Rabbitt, M.P., M. Reed-Jones, L.J. Hales, and M.P. Burke. 2024. Household Food Security in the United States in 2023. United States Department of Agriculture, Agriculture Research Service. Available at <https://ers.usda.gov/sites/default/files/laserfiche/publications/109896/ERR-337.pdf?v=86477>. Accessed 3 March 2025.
41. Remley, D., B. Rapp, D. Contreras, P. Duitsman, L. Moore, J. Rauch, and L. Franzen-Castle. 2019. *Voices for Food: Pantry Toolkit*. South Dakota State University Extension. Available at <https://extension.sdstate.edu/sites/default/files/2019-11/P-00106-02.pdf>. Accessed 3 March 2025.
42. Saldaña, J. 2016. *The Coding Manual for Qualitative Researchers* (Third ed.). SAGE Publications, Inc., Los Angeles, CA.
43. Schonberger, H.L., R.R. Boyer, and M.W. Chase. 2018. Food-handling behaviors of student volunteers in a university food recovery program. *Food Prot. Trends* 38(4): 284–294.
44. Schroeder, M., L. Yang, J. Eifert, R. Boyer, M. Chase, and S. Nieto-Montenegro. 2016. Evaluation of how different signs affect poultry processing employees' hand washing practices. *Food Control.* 68:1–6.
45. Spees, C. K., A. Alwood, K.N. Wolf, S. Rusnak, and C.A. Taylor. 2017. Poor adherence to preventive health care and cancer screening guidelines among food pantry clients. *J. Hunger Environ. Nutr.* 12(1):123–135.
46. Strohbehn, C., M. Shelley, S. Arendt, A.P. Correia, J. Meyer, U.F.U.Z. Abidin, and J. Jun. 2014. Retail foodservice employees perceptions of barriers and motivational factors that influence performance of safe food behaviors. *Food Prot. Trends* 34(3):139–150.
47. United States Food and Drug Administration. 2022. *Model Food Code*. Available at <https://www.fda.gov/media/164194/download?attachment>. Accessed 3 March 2025.
48. United States Department of Agriculture, Food Safety Inspection Service. 2020. *FSIS Guideline to Assist with the Donation of Eligible Meat & Poultry Products to Non-Profit Organizations*. Available at https://www.fsis.usda.gov/sites/default/files/media_file/2021-01/FSIS-Guideline-Food-Donation.pdf. Accessed 3 March 2025.