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# In-depth Interviews with Child Nutrition Directors: Challenges to Food Safety Training

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## ABSTRACT

Younger students could have a higher risk of foodborne illness, therefore ensuring safe food handling practices of child nutrition meals is a priority for child nutrition directors. Training of employees on food safety is one approach to decreasing this risk. Understanding challenges to current training is paramount to identifying best practices and mitigating future issues. The aim of this study was to conduct a detailed examination of child nutrition directors' training challenges through in-depth interviews. Identified themes included the role of the director, the training modality, and the effect of behavior change. Further practical implications are identified and discussed.

**Keywords:** Food Safety; Child Nutrition Programs; Qualitative Research; Training

## INTRODUCTION

Under the National School Lunch Program (NSLP), a vast collective of nearly half a million child nutrition workers are engaged across roughly 100,000 schools, providing daily lunches to about 29.6 million children (USDA, 2024). Though the NSLP's core aim is to deliver low-cost or complimentary lunches that are nutritionally sound to students each day, it's worth noting that the average employee in this sector often lacks advanced education or specialized culinary training, which is critical for preparing meals that are both safe and tasty, as well as compliant with nutritional standards (Stephens et al., 2015). The USDA mandates that all child nutrition staff complete yearly training – six hours for those employed full-time and four hours for part-time workers (USDA, 2015). While child nutrition directors are required to complete a minimum of 12 training hours across various operational areas, including food safety (USDA Food and Nutrition Service, 2023).

Critically, highest risk population for foodborne illness includes children under 5 years of age. However, all school-aged children represent a vulnerable population requiring special consideration for food safety practices. Recent research by Leal et al. (2023) indicates that school-aged children remain susceptible to foodborne illness due to developing immune systems and congregate feeding environments. The CDC (2021) continues to identify schools as significant settings for foodborne illness outbreaks, underscoring the importance of effective food safety training in child nutrition programs.

Studies have surfaced several pressing problems within the current operation of child nutrition programs, including issues such as insufficient time, employee turnover, inadequate utilities for cooking from scratch, and a general shortage of culinary expertise needed to create appetizing and nutritionally

adequate meals (Strohbehn et al., 2014; Tabak & Moreland-Russell, 2015; Stephens, et al., 2015). The outcome is a noticeable drop in the acceptance rate of school meals among students (Yon, et al., 2016). Flure et al. (2021) call attention to the vital role that professional development plays in the success of child nutrition programs. Prior research emphasizes the urgent requirement for training in food hygiene and safety, as well as in culinary techniques (Arendt et al., 2014; Stephens et al., 2015). Reynolds and Dolasinski (2019) have scrutinized foodservice training methodologies, revealing that the widespread preference is lecture-based sessions with simple visual aids. Recent systematic reviews and meta-analyses have demonstrated that while food safety training generally improves knowledge, its impact on sustained behavioral change varies significantly (Insfran-Rivarola et al., 2020; Alkhalidi et al., 2025). This gap between knowledge acquisition and behavior change represents a critical challenge for child nutrition programs. Recent research by Peabody et al. (2024) examined the relationship between food safety training approaches and actual behavior change among child nutrition staff. Their study of 42 school districts found that training programs incorporating hands-on practice components resulted in significantly higher rates of proper food handling behaviors compared to knowledge-based training alone. As Peabody et al. (2024) note, 'The integration of experiential learning techniques with traditional knowledge transfer approaches appears to bridge the persistent gap between food safety knowledge and practice in school nutrition environments' (p. 83). This finding aligns with our focus on understanding the challenges directors face in translating food safety training into consistent behavioral practices. Additionally, research has observed a noteworthy gap when it comes to innovative training strategies which can enhance confidence and motivation, thereby increasing the practical application of knowledge and skills (Stephens et al., 2015).

Addressing the health inspection records of child nutrition programs, Lee and Liu (2020) pinpointed the most frequent critical infractions: controlling temperatures for at-risk foods, inappropriate use of equipment, and mishandling of hazardous substances. They found common non-critical issues as well, particularly associated with the use of equipment and maintaining facilities and equipment for food temperature control. While it is not unprecedented to identify violations of food safety in child nutrition programs, ongoing research spanning several years to determine trends in food safety violations is scarce. Identifying these trends could lead to bespoke training interventions that may reduce the risk of foodborne illnesses.

Moreover, numerous obstacles confront efforts to train child nutrition workers, such as the unavailability of physical space for training. Timing, funding limitations for travel, and extra remuneration are recurrent barriers to training attendance, as identified by Lee, Kwon, and Sauer (2014). Additionally, Tabak and Moreland-Russell (2015) highlighted the exacerbated problem of insufficient time for training due to labor shortages. The CDC reports that incorrect food handling, poor personal hygiene, and cross-contamination are the leading errors contributing to foodborne diseases (CDC, 2021), with school-related outbreaks constituting 8.2% of all reported cases between 2000-2010 (Venuto & Garcia, 2015). A comprehensive review from Jones et al. (2013) outlined the need for food safety training. Similarly, Reynolds et al. (2022) found that nearly 94% of food service directors prefer on-the-job training, typically lasting less than two hours, focusing on food production and safety. An improved understanding of the perceived obstacles to training could greatly aid in creating future training programs.

The primary objective of this research is to delve into the perceived hurdles and barriers that child nutrition directors face regarding their current food safety training practices. This would aid in systematically identifying the training and work support needs of child nutrition workers, which could then be turned into tailored training plans incorporating constructivist teaching methods in subsequent projects. This was completed through in-depth interviews of child nutrition directors.

## METHODS

### The Research Design

To further understand child nutrition directors' perspectives on challenges to current training practices a semi-structured interview protocol was developed and informed based on previous research (Reynolds et al., 2022), literature review, and input from foodservice, food safety, and training development content experts. A qualitative approach was utilized to better understand the rich contextual data that is often missed in quantitative approaches. With qualitative inquiry, "The key concern is understanding the phenomenon of interest from the participants' perspectives, not the researcher's" (Merriam & Tisdell, 2016, p. 16).

### Target Population

The target population of this study was elementary through high school child nutrition directors. Child nutrition directors were selected because of their responsibilities to provide training to staff including the planning, decision making, and execution of the trainings. A total of 50 child nutrition directors were targeted, to provide a national representative convenience sample. This targeted sample size is aligned with previous child nutrition director research ( $n=10$ ) (Yon et al., 2016) and ( $n=16$ ) (Gupta et al., 2025) using a similar method.

Child nutrition directors from each of the seven USDA Food and Nutrition Service regions were targeted (USDA Food and Nutrition Service, 2023). The use of participants from different areas of the country and school sizes helps increase generalizability and credibility (Merriam, 2009). Our approach to recruiting child nutrition directors from diverse geographic regions and district sizes aligns with recent qualitative research (Jowell et al., 2023) which employed purposive sampling to ensure representation across rural, suburban, and urban school districts when examining food service adaptations during the COVID-19 pandemic.

### Interview Protocol

A semi-structured interview protocol was developed. The interview protocol was informed by validated measurement scales for food safety culture assessment (Yu et al., 2021), ensuring that questions addressed both technical and cultural aspects of food safety training. The interview protocol contained, first several open-ended questions, then follow-up questions were developed as additional probing questions.

### Data Collection

Child nutrition directors were contacted via email as a continuation of a research project conducted by Reynolds et al. (2022) and provided the study purpose and request for inclusion in the current study. Upon completion of informed consent form, interview times were scheduled. All interviews were conducted by a single researcher experienced in qualitative methods. Interviews were conducted in-person or via a video conference call. All interviews were recorded and transcribed verbatim. Interviews ranged from 45-60 minutes in length. Participants were first asked several demographics and descriptive questions: followed by several open-ended questions. An example question was: "Of the food safety training or trainings you conducted last year, what would you consider a major challenge?". Follow-up questions were systematically employed using a predetermined protocol of potential probing questions that were triggered by specific participant responses, enabling deeper exploration of emerging themes while maintaining methodological consistency. This approach (Creswell & Poth, 2023) to follow-up questioning allowed interviewers to delve into directors' experiences with food safety training challenges, encouraging participants to provide concrete examples and elaborate on initial responses while ensuring

all key areas of inquiry were thoroughly addressed. In qualitative research, focus is given to the depth and breadth of the data, not the quantity of data, thus the open-ended, semi-structure interview protocol was used (Creswell, 2013).

### Data Analysis

Each interview transcript resulted in a range of 15 to 30 pages of typed, single-spaced text with 12-point font. Following the protocol developed by Arendt et al. (2014) the research team, including three members, independently analyzed manually the transcripts from each interview. The protocol included, reviewing each transcription several times, then identifying coding of segments, followed by, gathering of coding into themes, finally, commonalities between transcripts were explored. After independent review, each member of the research team reached 100% agreement on themes and related codes. NVivo software was used to provide confirmation of the manual qualitative research analysis. A comparison of the manual analysis and the software analysis was conducted for commonalities and differences. The qualitative analysis software allowed for organizing and enriched analysis with visual presentation of the relationships of the findings.

### RESULTS AND DISCUSSION

A total of 17 child nutrition directors participated in an interview. Participants in this study were predominantly male (75%) and held the title of child nutrition director (94%). The majority (59%) had over 14 years of child nutrition experience. Finally, participants represented a variety of school district sizes: less than 500 students (12%) to more than 10,000 (18%); as well as oversaw a varying range of full-time child nutrition employees: 1-2 employees (6%) to more than 12 employees (12%), see Table 1.

**Table 1: Descriptive Characteristics (n=17)**

	<i>n</i>	%
Gender		
Male	13	(76.5)
Female	4	(23.5)
Role in Child Nutrition		
Child nutrition director	16	(94.1)
School administration (superintendent, principal)	1	(5.9)
Years' Experience in School Foodservice		
5-7	2	(11.8)
8-10	2	(11.8)
11-14	3	(17.6)
More than 14	10	(58.8)
Number of Students in School District		
Less than 500	2	(11.8)
501-2,499	4	(23.5)
2,500-9,999	8	(47.1)
More than 10,000	3	(17.6)
Number of Full-time Child Nutrition Employees		
1-2	1	(5.9)
3-5	2	(11.8)
6-8	4	(23.5)
9-12	8	(52.9)
More than 12	2	(11.8)

The following results directly address the food safety training challenges, approaches, and innovations identified by child nutrition directors. Each theme is explicitly connected to training implications, with supporting evidence from participant quotes and relevant literature. Figure 1 provides a visual representation of how these themes interconnect within the broader context of food safety training in child nutrition programs. As recommended by Braun and Clarke (2021) when reporting qualitative research, quantitative representations should be incorporated to balance with the rich qualitative descriptions to maintain the depth of findings. Table 2, illustrated the number and percentage of child nutrition directors that noted each sub-theme as a barrier or challenge.

**Table 2: Frequency of Themes and Sub-Themes Mentioned by School Nutrition Directors (n=17)**

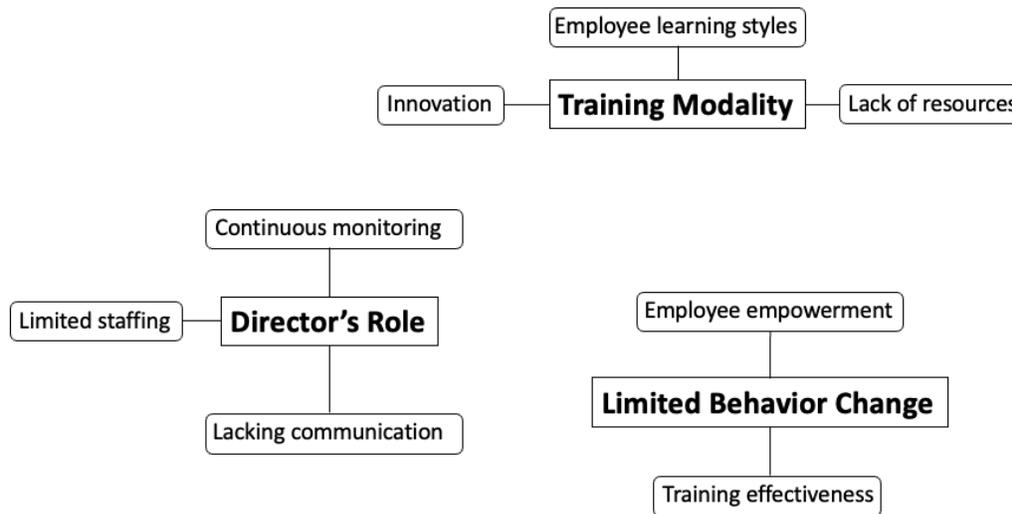
Theme & Sub-themes	Percentage	Number of Directors
Director's Role		
Continuous Monitoring	88%	15/17
Limited Staffing	82%	14/17
Lacking Communication	65%	11/17
Limited Behavior Change		
Training Effectiveness	88%	15/17
Employee Empowerment	47%	8/17
Training Modality		
Innovation	94%	16/17
Lack of Resources	76%	13/17
Employee Learning Styles	59%	10/17

Three main themes were identified, when exploring the main research objective, exploring the perceived hurdles and barriers that child nutrition directors face regarding their current food safety training practices. The main themes, as illustrated in Figure 1, include: The “Director’s Role”; “Limited Behavior Change”; and “Training Modality”. The following sections examine each main theme and subthemes.

### Director's Role in Food Safety Culture

Child nutrition directors play a crucial role in establishing and maintaining food safety culture within their organizations. Food safety culture has emerged as a critical factor in preventing foodborne illness outbreaks in institutional settings. Griffith et al. (2010a) identified food safety culture as "an emerging risk factor" requiring proper assessment methods (Griffith et al., 2010b). The importance of organizational culture in supporting training effectiveness is highlighted by Zanin et al. (2022), who developed a roadmap for educational interventions based on food safety culture assessments in institutional foodservice settings. Within the main theme, three sub-themes were identified during data analysis. These sub-themes include: “Continuous monitoring”, “Limited staffing”, and “Lacking communication”. The following section discusses each of the sub-themes with directors’ quotes for context.

**Figure 1: Qualitative Themes and Codes**



### ***Continuous Monitoring***

The most frequently mentioned sub-theme under the director's role, continuous monitoring, was emphasized by 88% (15/17) of directors, who described the ongoing nature of maintaining food safety standards beyond initial training sessions and the need for consistent observation and feedback mechanisms.

*"It only takes one slip-up to compromise the health of our students. The pressure is immense." (Director 4)*

*"We're up against so many challenges – tight budgets, time constraints, staff turnover. It sometimes feels like an uphill battle to maintain food safety standards." (Director 9)*

The director's role extends beyond policy creation to active reinforcement through observation and feedback. Reynolds (2020a) emphasizes that the manager (Director) of an operation has a major role in the food safety program, particularly in reinforcing training through direct observation. This ongoing reinforcement is critical, as training and knowledge assessment alone is not enough to fully understand or change food safety behaviors (Reynolds & Rajagopal, 2017a).

Research consistently shows that management commitment significantly influences employee food safety behaviors (Clark et al., 2019). Authority figures serve as "main influencers who create and shape culture" (Clark et al., 2019, p. 189), with management commitment positively affecting food safety training outcomes by motivating employees to adhere to proper practices (Clark et al., 2019).

*"...food safety states at the top and trickles down." (Director 2)*

### ***Limited Staffing***

Limited staffing emerged as a significant barrier to implementing comprehensive food safety training, with 82% (14/17) of directors specifically citing staffing constraints that impacted their ability to schedule training sessions without disrupting daily operations.

*"My top priority is ensuring every student has access to safe, nutritious food. That's non-negotiable." (Director 6)*

*"Food safety is a priority, and we're building a team that prioritizes it every step of the way. However, funding doesn't allow the staffing resources we truly need." (Director 12)*

This finding parallels recent research by Jowell et al. (2023), who found that staffing shortages during the COVID-19 pandemic exacerbated existing challenges in maintaining food safety standards in school nutrition programs. Similarly, in a study of Oklahoma child nutrition directors, "limited staffing (63.9%)" was cited as the primary barrier, followed by "concern for student satisfaction (58.1%), and time management (50.3%)" (Peabody et al., 2024). Furthermore, when staffing is limited, employees must manage multiple responsibilities simultaneously, creating what researchers call "role overload" (Clark et al. 2019).

### *Lacking Communication*

Directors are responsible for communicating food safety expectations clearly, consistently, and effectively. Recent research by Martinez-Tome et al. (2022) supports this approach, finding that food handlers with diverse backgrounds benefit from varied communication strategies. We have incorporated this literature and clarified the specific communication challenges and potential solutions identified in our study. Analysis revealed that 65% (11/17) of directors reported communication challenges, primarily related to ineffective communication strategies rather than a complete absence of communication, with many noting the need for multimodal approaches to reach diverse staff.

*"Sometimes I feel like a broken record, reminding staff about basic food safety practices. It's a constant struggle."*  
(Director 13)

*"It's frustrating when people don't take food safety seriously. We're talking about the well-being of our children."*  
(Director 5)

*"It's a constant juggling act, trying to balance discussing food safety and daily operations..."* (Director 9)

Reynolds and Rajagopal (2017b) found that childcare food handlers perceived a lack of consistency and timeliness of food safety information received from childcare directors. The study also revealed that respondents working in facilities with written food safety policies identified key motivators including written policies and procedures as well as a workplace that does not tolerate unsafe handling behaviors. Similarly, our findings regarding communication challenges echo recent research by Lee et al. (2023), who found significant disconnects between food safety knowledge and actual practices among school canteen handlers, often attributed to communication barriers. "The manager plays a key role in the food safety culture by establishing policies and standards, expecting accountability, serving as a role model, controlling rewards and punishment, providing training, and providing needed resources to follow food safety practices," (Arendt, Paez, & Strohbehn, 2013, p. 126). Furthermore, recent research by Gould et al. (2023) highlights the critical relationship between manager training and food safety outcomes in foodservice establishments. Their study of restaurant managers found that those with comprehensive food safety training were significantly more likely to implement effective monitoring systems and create a positive food safety culture among staff. As Gould et al. (2023) noted, "Manager knowledge and commitment to food safety practices were strongly associated with employee compliance rates and overall establishment performance on food safety inspections" (p. 608). This finding has important implications for child nutrition programs, suggesting that director training may be a key leverage point for improving food safety communication throughout the organization. This aligns with USDA Professional Standards for School Nutrition Professionals, which require a minimum of 12 training hours for directors across various operational areas, including food safety (USDA Food and Nutrition Service, 2023).

## Limited Behavior Change

The persistent gap between food safety knowledge and actual practices represents a significant challenge in child nutrition programs. Research consistently demonstrates that knowledge acquisition does not automatically translate to behavior change in food safety practices (Da Cunha et al., 2019). Traditional training approaches often fail to address the underlying factors that influence behavior beyond knowledge deficits. Alcorn et al. (2022) identified salient beliefs of school nutrition employees that impact food safety behavior, highlighting the importance of addressing attitudes and perceptions in training design. Similarly, Roberts et al. (2020) applied the theory of planned behavior to determine that multiple factors influence compliance beyond just knowledge, suggesting that conventional training alone may be insufficient to create meaningful behavior change. This knowledge-behavior gap is influenced by organizational culture, practical implementation barriers, and individual attitudes toward food safety practices (Reynolds & Rajagopal, 2017). Addressing limited behavior change requires comprehensive approaches that improve training effectiveness and increase employee empowerment.

Within the main theme of limited behavior change, two sub-themes were identified during data analysis. These sub-themes include: "Training effectiveness" and "Employee empowerment". The following section discusses each of the sub-themes with directors' quotes for context.

### *Training Effectiveness*

Concerns about training effectiveness and the gap between knowledge acquisition and behavior change were expressed by 88% (15/17) of directors, making this one of the most frequently mentioned challenges, with many directors noting frustration with the "knowing-doing gap" despite substantial investments in training.

*"We can provide all the training in the world, but translating that knowledge into consistent daily practices is where we struggle most." (Director 2)*

However, many directors emphasized that training doesn't always translate to improved long term food safety practices. The challenge of achieving lasting behavior change following food safety training was a recurring theme among directors in our study. This aligns with findings from Peabody et al. (2024), who documented that only 37% of child nutrition programs achieved sustained compliance with food safety protocols six months after traditional training interventions. Their research suggests that continuous reinforcement strategies, similar to those mentioned by our participants, were associated with significantly higher rates of long-term compliance.

*"It's frustrating when training doesn't translate to lasting change. We need to find engaging ways to keep food safety top-of-mind." (Director 11)*

*"... It's not enough to just teach, we need to inspire lasting change." (Director 12)*

*"It's like they forget everything they learned the minute they step out of the training session." (Director 4)*

Research consistently demonstrates that knowledge acquisition does not automatically translate to behavior change in food safety practices. The challenge of knowledge retention aligns with findings from Hirimuthugoda et al. (2024), who demonstrated that workers receiving biannual refresher courses showed 30% higher compliance with hygiene protocols compared to those receiving only initial training. Traditional training approaches often fail to address the underlying factors that influence behavior. Alcorn et al. (2022) identified salient beliefs of child nutrition employees that impact food safety behavior, highlighting the importance of addressing attitudes and perceptions beyond just knowledge transfer. Similarly, Roberts et al. (2020) used the theory of planned behavior to determine that multiple factors influence compliance beyond just knowledge. This suggests that training alone may not be sufficient to create meaningful behavior change.

## ***Employee Empowerment***

Strategies to promote employee empowerment and ownership of food safety practices were mentioned by 47% (8/17) of directors, who sought to develop "food safety champions" rather than mere rule-followers by fostering a culture of accountability and personal responsibility.

*"...constantly evaluating our training methods to ensure they're effective, there's always room for improvement."*  
(Director 10)

*"...creating a culture of food safety that extends beyond the training room."* (Director 6)

*"We're empowering our staff to be food safety champions, not just rule followers. It's about ownership and accountability."* (Director 1)

Furthermore, researcher recommends incorporating behavior-based elements into training. Wong et al. (2020) suggest including "motivation, role modeling, mentoring, provision of tools and supplies, and managerial support after training" to enhance effectiveness. Similarly, Alcorn et al. (2022) proposed that intervention strategies could use realistic-event videos focusing on employees' subjective norms and perceived behavioral controls to better influence intentions and behaviors. Self-efficacy interventions, as described by Wong et al. (2020), have shown success in improving selected food safety behaviors among food handlers, supporting our directors' emphasis on building employee confidence through training. These findings collectively suggest that effective behavior change strategies must address the complex interplay of knowledge, attitudes, organizational culture, and continuous reinforcement within child nutrition programs.

## **Training Modality**

Within the main theme of training modality, three sub-themes were identified during data analysis. These sub-themes include: "Innovation", "Lack of resources", and "Employee learning styles". The following section discusses each of the sub-themes with directors' quotes for context.

### ***Innovation***

Research indicates a need for innovation in food safety training modalities beyond traditional lecture-based approaches. Visual-based minimal-text training materials have shown promise, particularly for diverse audiences. Beyond traditional educational approaches, integrating behavioral nudges with food safety training has shown promising results in child nutrition programs (Madjdian et al., 2024), supporting our directors' emerging interest in behavioral interventions. Rajagopal et al. (2019) created visual-based minimal-text training materials comprising 10 handouts and one PowerPoint presentation for Chinese-speaking food service workers, noting that these visual aids are an inexpensive educational tool and have been shown to be effective in other foodservice settings.

Innovative approaches to food safety training were described by nearly all directors (94%, 16/17), who discussed implementing new technologies and methods such as microlearning modules, visual aids, and hands-on demonstrations to enhance training effectiveness.

*"We're embracing technology to make food safety training more accessible and engaging for our diverse staff."*  
(Director 8)

*"...we offer flexible training options to accommodate different learning styles and schedules."* (Director 1)

This aligns with findings from Gupta et al. (2025), who documented how child nutrition directors developed creative solutions to training challenges during the COVID-19 pandemic. Their research identified that directors who implemented hybrid training models—combining self-paced digital modules with targeted in-person demonstrations—reported higher staff engagement and knowledge retention compared to those using traditional approaches.

Emerging technologies are also being explored for food safety training. Some directors expressed interest in emerging technologies for food safety training. This aligns with recent research on AI-enhanced food safety training, which has shown promise in personalizing learning experiences and improving engagement among food handlers (Wang et al., 2025). Recent research by Jeong et al. (2023) demonstrates the significant potential of spatial augmented reality (sAR) in culinary training environments. Their study comparing sAR Kitchen with traditional video tutorials found that augmented reality demonstrations improved learning outcomes by 27% and increased engagement by providing real-time, interactive guidance in the actual work environment. As they note, 'sAR technology creates an immersive learning experience by projecting digital information directly onto physical objects and surfaces in the kitchen, allowing trainees to receive step-by-step guidance while maintaining hands-free operation' (Jeong et al., 2023, p. 768).

Reynolds (2022) suggests that future educational interventions could utilize advanced technology such as augmented reality to educate child nutrition employees in real time on the job. The COVID-19 pandemic accelerated the adoption of virtual training methods. Recent research by Beary et al. (2025) identified significant opportunities for accessible and effective distance learning in food safety education, particularly for reaching geographically dispersed staff in rural school districts.

Clark et al. (2020) assessed perceptions of a video game designed to promote handwashing habits in foodservice, noting that such technology could complement other pillars of habit formation. Wong et al. (2020) described an innovative approach that incorporated real case stories, the use of disgust, and error-based training. This included storytelling about actual food poisoning incidents, visual demonstrations of microbial contamination using GloGerm powder and a handheld UV light, and hands-on activities to demonstrate cross-contamination. This multi-sensory approach engages learners more effectively than traditional methods.

The Spatial Augmented Reality (sAR) Kitchen represents another innovative approach, designed as an sAR tutorial system for culinary training where users are able to watch a pre-recorded, step-by-step tutorial using the sAR system while simultaneously performing the tasks on their end (Ghasemi et al., 2023). This approach has potential benefits for food safety training, as visual and auditory stimuli are easier to understand and using visual cues reduces the cognitive load.

### ***Lack of Resources***

Resource limitations, including time, budget, and space constraints, were cited by 76% (13/17) of directors as significant barriers to implementing ideal food safety training programs, forcing many to adapt their approaches within existing constraints.

*"It's challenging to find the time and resources to implement engaging training programs. We're often limited by budget constraints." (Director 3)*

*"With our limited budget, we're forced to use outdated training materials and can't afford the interactive programs that would really engage our staff and make food safety concepts stick." (Director 8)*

Resource constraints identified in our study parallel those found in diverse food service settings globally. Gameda et al. (2025) identified inadequate resources as a significant barrier to implementing food safety practices, even when knowledge levels were adequate. Similar challenges have been identified in research pertaining to limited opportunities for training due to time constraints (Tabak & Moreland-Russell, 2015). Additionally, Reynolds and Rajagopal (2017) found that the top four perceived important barriers pertained to time and work limitations: 'too much work to do', 'the work pace', 'too busy', and 'lack of time.' Similarly, Giampaoli et al. (2002) identified time as "one of the greatest challenges" to implementing food safety practices in child nutrition programs.

The challenge of time for training is compounded with the concept of "role overload", which is directly connects time constraints to food safety behaviors. Clark et al. (2019) define role overload in the food safety context as the extent to which food handlers feel they have inadequate time, training, and/or resources to wash their hands as often and as proficiently as they should. They note that role overload reflects organizational culture and often forces employees to spend time on the primary priority, which then dictates that taking short cuts is necessary with lower priority behaviors. Importantly, food safety training programs show mixed results in improving compliance with food safety standards. However, Da Cunha et al. (2013) demonstrated that long-term intervention strategies based on knowledge, attitude, and practice can improve food safety in child nutrition programs. These findings reinforce the need for continued training interventions, though overcoming the identified challenges will require novel approaches.

### ***Employee Learning Styles***

The importance of addressing diverse employee learning styles was emphasized by 59% (10/17) of directors, who recognized that standardized training approaches were insufficient for their diverse workforce with varying educational backgrounds, language proficiencies, and learning preferences.

*"I've noticed our younger staff learn best from videos and hands-on demonstrations, while our veteran employees prefer written procedures they can reference, which means I'm constantly creating multiple versions of the same training materials to be effective." (Director 9)*

*"When I switched from lecture-style training to a combination of visual aids, hands-on practice, and short video clips, I saw immediate improvements in comprehension across my staff, especially among those who struggle with English as their second language." (Director 4)*

While lecture style was identified in the research as the most common training modality (Reynolds & Dolasinski, 2019), there is growing evidence supporting the effectiveness of multi-modal approaches. Dolasinski and Reynolds (2020) developed a microlearning model for training that utilizes multiple modalities in the design of the training module, including a short video, a scripted pre-shift mini-lecture, a poster providing a visual, and a business card sized companion card. This approach aligns with the finding that using multiple training methods in short training sessions can be effective (Reynolds & Jeong, 2022). Furthermore, The directors' interest in microlearning approaches is supported by recent research comparing microlearning to traditional training methods in child nutrition programs, which found that microlearning resulted in better knowledge retention and application (Maneerat et al., 2024).

## **CONCLUSIONS AND APPLICATIONS**

Effective food safety training in child nutrition settings requires a multifaceted approach that addresses not only knowledge gaps but also attitudes, organizational culture, and practical barriers to implementation. Findings will assist in the development of future customized training methods and content. Training programs should be designed with consideration for the specific context of child nutrition programs and should incorporate strategies to bridge the gap between knowledge and practice. Future research should focus on developing and evaluating interventions that address the complex interplay of individual, organizational, and environmental factors that influence food safety behaviors in school settings.

The research clearly demonstrates that directors and managers play a pivotal role in establishing and maintaining food safety culture within child nutrition programs. Management commitment significantly influences employee food safety behaviors (Clark et al., 2019), with authority figures serving as main influencers who create and shape culture (Clark et al., 2019). Directors are responsible for communicating food safety expectations clearly and consistently, as inconsistent messaging has been identified as a barrier to proper food handling practices (Reynolds & Rajagopal, 2017b). The implementation of written

policies and procedures has been shown to be a key motivator for food safety compliance (Reynolds & Rajagopal, 2017b). Furthermore, the director's role extends beyond policy creation to active reinforcement through observation and feedback, as the manager of an operation (childcare director) has a major role in the food safety program (Reynolds, 2020b). This ongoing reinforcement is critical because training and knowledge assessment alone is not enough to fully understand or change food safety behaviors (Reynolds & Rajagopal, 2017).

Traditional food safety training approaches often fail to produce lasting behavior change among child nutrition workers. Research consistently demonstrates a gap between knowledge acquisition and actual practice, with Da Cunha et al. (2019) identifying significant differences between observed and self-reported food safety practices. This knowledge-behavior gap is influenced by multiple factors beyond knowledge deficits, including attitudes, organizational culture, and practical barriers to implementation. Alcorn et al. (2022) identified salient beliefs of child nutrition employees that impact food safety behavior, highlighting the importance of addressing underlying attitudes and perceptions. Resource constraints further complicate behavior change efforts, with limited staffing (63.9%), concern for student satisfaction (58.1%), and time management (50.3%) identified as top challenges faced by child nutrition professionals (Reynolds, Jeong & Nam, 2022).

Emerging research points to the effectiveness of innovative, multi-modal approaches to food safety training. Dolasinski and Reynolds (2020) developed a microlearning model that utilizes multiple modalities in the design of the training module, including a short video, a scripted pre-shift mini-lecture, a poster providing a visual, and a business card sized companion card. This approach aligns with findings that using multiple training methods in short training sessions can be more effective than traditional approaches (Reynolds & Jeong, 2022). Visual-based minimal-text training materials have shown promise, particularly for diverse audiences (Rajagopal et al., 2019). Wong et al. (2020) described an innovative approach that incorporated real case stories, the use of disgust, and error-based training, engaging learners through multiple sensory channels. Emerging technologies such as augmented reality and video games also show promise for enhancing food safety training effectiveness (Reynolds, 2022; Clark et al., 2020).

Finally, future research should address critical gaps in our understanding of how to effectively promote food safety in child nutrition programs. A mixed-methods study examining the effectiveness of various training modalities (in-person, online, microlearning) on both knowledge retention and behavior change among both directors and employees to provide a more comprehensive understanding of training effectiveness, with specific measurement protocols. Another research direction would be longitudinal research tracking the relationship between director leadership training and subsequent improvements in employee food safety compliance, potentially using the Food Safety Climate tool developed by De Boeck et al. (2022). By focusing on the director's role, addressing barriers to behavior change, and developing innovative training approaches, future research can contribute to the development of more effective food safety interventions that protect vulnerable student populations. Another important research agenda would be an intervention study testing innovative approaches to reinforcement and continuous monitoring, such as gamification elements or technology-assisted observation tools, as this was identified as a needed approach for future training. Future research could building on the work of Jeong et al. (2023), who demonstrated sAR's effectiveness in culinary training, studies could examine how this technology might be adapted to address the unique food safety training challenges in school environments. Finally, a comparative analysis of food safety training approaches across different institutional foodservice settings (schools, healthcare, universities) to identify transferable best practices.

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