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EDITOR'S NOTE

Welcome to the Spring 2026 issue of the *Journal of Child Nutrition & Management (JCNM)*!

Please consider submitting manuscripts to the *JCNM* to further the dissemination of research and other relevant information in our field. Articles can be submitted in one of the following categories: 1) Commentary, 2) Current Issue, 3) Practical Solution, 4) Research in Action, or 5) Research Briefs. Information on *JCNM* contribution and reprint guidelines can be found at the following link.

RECOGNITION OF REVIEWS

Thank you to the peer review team that contributed to this issue. Your contributions are invaluable! Please consider supporting the efforts of the *JCNM*, by serving as a reviewer or nominating a colleague. For more information, please do not hesitate to contact: Keith.rushing@usm.edu.

IN THIS ISSUE

There are four Research in Action (RIA) articles, The article topics include: Job demands of school nutrition employees associated with the COVID-19 pandemic; the association between produce intake and school grade; the impact of produce safety university on the work of child nutrition specialists; and **the challenges and support needs to implement the added sugar regulation.**

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Job Demands Resources Model Applied to School Nutrition Employee Experiences with COVID-19 Pandemic: A Qualitative Study

- Emily Patten, PhD, RDN, CD, J. Mitchell Vaterlaus, PhD, Lori Spruance, PhD, Mckenna Jones, MS, RDN, Erica Card, MS, RDN, CD, Dayle Hayes, MS, RDN, Jeanne Reilly, NDTR, SNS and Brennan Rotar, BS

KEYWORDS: child nutrition, Child Nutrition Programs, school meals, COVID-19, Jobs Demands-Resources (JD-R) Model, employee well-being

INTRODUCTION:

Child Nutrition Programs and the COVID-19 Pandemic

Child Nutrition Programs (CNP) have played an important role in mitigating food insecurity since their inception, including during the COVID-19 pandemic. However, in this unique context, CNP employees needed to adjust how they approached meal production and service in response to virus mitigation practices. The United States Department of Agriculture (USDA) offered a series of waivers increasing meal pattern flexibility; therefore, allowing CNP employees to offer meals in innovative ways and use nontraditional service methods (Braun et al., 2022; Centers for Disease Control, 2021; Jowell et al., 2021; Kenney et al., 2021; Patten et al., 2021a; School Nutrition Association [SNA], 2022a; USDA, 2023). As the pandemic evolved, many children returned to in-person learning, requiring still more innovation in balancing virus mitigation practices with feeding children (Jowell et al., 2021).

In CNPs, the two most significant reported costs are food and labor– about 45% each (USDA, 2019). Therefore, exploring the labor side of the child nutrition industry is imperative, especially amid a long-term disaster response. Several studies explored the experiences of CNP employees during the early pandemic. In a national survey conducted in March/April 2020, over half of respondents (55.6%) reported some burnout, while a majority (63.1%) still reported some job satisfaction (Patten et al., 2021a). These employees reported concerns such as risk of virus exposure, lack of organizational support, challenges with work processes changing, and personal frustration and exhaustion. At the time, most indicated "always" (40.5%) or "most of the time" (40.8%) having adequate staffing (Patten et al., 2021a). Staffing and supply chain issues began emerging as more significant challenges later in 2020 (Braun et al., 2022; Katz et al., 2022) and continue today (SNA, 2025).
In a national, qualitative interview study conducted in April/May 2020, CNP employees highlighted their commitment to feeding children as their motivation for responding to the crisis (Patten et al., 2021b). This finding is consistent with another qualitative study conducted with nutrition directors in North Carolina during the summer of 2020 (Katz et al., 2022), which found that directors reported their motivation was connecting with students and the directors' sense of purpose in feeding children.

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Frontline essential workers assumed significant risk during the pandemic. From September 2020 to March 2021, frontline workers not working in healthcare environments (e.g., cooks, janitors, childcare providers, etc.) had a higher risk of testing positive for COVID-19 than non-frontline workers (Do & Frank, 2021). Beyond the risk of contracting COVID-19, food retail, foodservice, and hospitality service workers faced substantial mental health consequences working through the pandemic (Rosemberg et al., 2021). Well-being during such a crisis is significantly impacted by demands imposed on employees and their resources for navigating such (Demerouti and Bakker, 2022). Furthermore, while existing studies demonstrate the experiences of child nutrition professionals during the initial pandemic response, it is equally vital to understand their experiences as the pandemic changed and persisted over time. To navigate the lingering effects of the current COVID-19 pandemic and prepare for future crises, child nutrition leaders must understand their employees' unique demands and ensure availability of the proper resources to address them.

Theoretical Framework

The Jobs Demands-Resources (JD-R) Model has been used to explore the experience of workers during the COVID-19 pandemic (Mojtahedzadeh et al., 2021; Sokal et al., 2020; Baarello et al., 2021; Zhou et al., 2022) and can likewise be applied to child nutrition professionals. The model proposes that each occupation has factors which fall into two categories: *job demands* and *job resources* (Bakker & Demerouti, 2007). *Job demands* are related to "physiological and/or psychological costs" to the employee. *Job resources* help employees meet their work goals and manage *job demands*. Essentially, *job demands* take up employee energy because they have to be addressed and *job resources* generate motivation and help mitigate the impact of *job demands* on employee well-being (Demerouti & Bakker, 2022; Bakker & Demerouti, 2017). The JD-R model proposes the *health impairment process* is that when employees face chronic *job demands* or a lack of *job resources,* this can lead to *negative strain reactions*. Secondly, the *motivational process* reflects how *job resources* contribute to employee *motivation* (Bakker & Demerouti, 2007). Ultimately, it is important that jobs are designed so that the demands are manageable for employees and that they have enough job resources to handle the demands (Demerouti & Bakker, 2022).

The purpose of this study was to first explore the pandemic-related work experiences of CNP employees during the School Year (SY) 2020–2021 and then apply the JD-R Model to their experiences to provide insight into opportunities for increasing *job resources*, managing *job demands*, understanding *motivation*, and reducing *negative strain reactions*.

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METHODOLOGY:

A qualitative study including semi-structured interviews was designed with the goal of understanding how CNP employees experienced working during SY 2020–2021.

Sample

Brigham Young University's Institutional Review Board deemed this study protocol as exempt level, Category 2 (E2020-140) in accordance with 45 CFR 61.111 in the USA. All participants reviewed an informed consent statement and indicated consent by proceeding with the interview. Following a national, 32-item survey (n=169; data unpublished) which was distributed via email to previous participants of an early pandemic study (Patten et al., 2021) and posted to recruit participants on a large child nutrition professional-focused Facebook group, a list of child nutrition professionals/directors (n=71) who indicated they would participate in an interview about their pandemic-related work experiences was created. Eligibility criteria included: >18 years old, living in the United States, and worked in a CNP role during SY 2020–2021. Employees with various roles within CNPs were invited for researchers to gain a broad understanding of the pandemic experience. Participants self-reported their demographic information (age, racial identity, ethnicity, gender, state, and urbanicity) and work characteristics (position title, hours worked per week, meals/snacks served, and pre-pandemic free and reduced rate of school or district).

Data Collection

Researchers emailed all 71 people who indicated interest to set up an interview time with the subject line, "Schedule Interview – School Nutrition COVID-19 Study," with the consent document attached. Three trained researchers conducted interviews over Zoom from May 17 to June 3, 2021. A semi-structured 13-item moderator's guide was developed based on previous research (Patten et al., 2021) and current CNP events. It was reviewed and revised by two community partners with experience in CNPs (Figure 1). Interviews lasted approximately 30-minutes. Topics included their role, challenges experienced, innovations developed, technology utilized, support felt, sentiment regarding no-cost meals, employee safety experience, morale, staffing, and mental health/well-being. The interviews were recorded and transcribed verbatim. Researchers interviewed everyone (n=30) who responded to their emails and only stopped recruitment efforts once there was representation from each USDA region and data saturation was reached (Krueger & Casey, 2020).

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Figure 1. *Moderator's Guide Used for Interviewing Participants About Their Experiences Responding to the COVID-19 Pandemic*

1. Please share what your job title is and what role you have played in navigating the pandemic during the 2020–2021 school year.
2. What have been your greatest challenges during this 2020–21 school year?
    a. What challenges are you facing as you look to the summer? Next fall?
3. What are some of the innovations you and your program have made over the past school year to respond to the pandemic?
    a. Which if any of these innovations would you like to see become typical practice after the pandemic?
    b. Which barriers, if any, do you see to instituting these changes?
4. What new technology, if any, have you adopted over the past year to navigate the changes brought on by the pandemic?
    a. How did you learn to use the new technology?
    b. Did you have support? Need more support?
    c. What additional technologies would have been helpful?
5. Over the past year, have you felt supported by your school district? State Agency? USDA? Community members? Please share your experiences.
6. How do you feel about USDA extending no cost meals for students through the next school year?
    a. How will this affect your program? Team?
7. With meals being offered to all children at no cost over the past year, what have you noticed about the stigma of no-cost meals? Same? Different? Please explain.
8. How safe have you felt while working during the pandemic?
    a. Did you feel like you had the policies and personal protective equipment you needed?
    b. What were and are your concerns about the safety of employees in your department?
    c. From your perspective, how safe did your school nutrition colleagues feel operating during a pandemic?
9. How would you describe your work team's morale right now?
    a. What are the primary drivers/motivators for this?
10. How has the pandemic affected school meal staffing?
11. What impact has the pandemic had on your mental health and well-being?
    a. Have you used any resources?
    b. What resources would have been helpful?
12. What support or resources do you most need as you look to operating school nutrition services next fall?
13. What are you most proud of as you look back over the past 2020–2021 school year?

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Reflexivity

Prior to data analysis, researchers discussed their positionalities. Two of the authors had direct experience with CNPs in their professional roles and five study child nutrition in their academic positions. One researcher is a family scholar and mental health professional who has been active in researching the COVID-19 pandemic. The formation of a research team with varied experiences was intentional to ensure the data collection processes were appropriate and the results derived from various perspectives. During the analysis and results writing, researchers openly discussed and sought to mitigate potential biases.

Data Analysis

Codebook Thematic Analysis. An inductive codebook thematic analysis was conducted (Braun et al., 2019). Three researchers reviewed each interview transcript and agreed on key headings to organize interview content (Nadin & Cassell, 2004). One researcher then developed summaries for each interview transcript (n=30, one for each participant). A second researcher checked each summary against the raw interview data for accuracy.

Next, codes were inductively identified by the three researchers through independent immersion. In total, 18 codes were agreed upon. A matrix was created (including 30 participants and 18 codes) by one researcher and checked for accuracy by a second. Finally, all three researchers reviewed the codes and organized them into three themes. To increase trustworthiness, member checking was implemented (Creswell, 2013). Participants were sent the completed results narrative and qualitative results table via email and confirmed the results were representative of their experiences.

Theory Triangulation. The second step in the analysis was to triangulate the inductive findings with the JD-R Model. Thematic analysis is a theoretically flexible method that does not require attachment to a pre-existing framework (Braun & Clarke, 2006). In a hybrid approach, inductive identification of themes can be complemented by subsequent deductive application of a priori theory to develop latent themes (Bradbury-Jones et al., 2022; Braun & Clarke, 2006; Fereday & Muir-Cochrane, 2006; Fife & Gossner, 2024). This situates the data within existing theory—leveraging the researcher's central, active role; enhancing methodological rigor; and allowing for a richer understanding of participants' experiences (Bradbury-Jones et al., 2022; Braun & Clarke, 2019; Gioia et al., 2012). In the present study, one researcher connected the results from inductive qualitative analysis with the core elements of the JD-R Model by reviewing the codes/themes and categorizing each finding as either a *job demand, job resource, strain reactions,* or *motivation*; the rest of the research team reviewed and revised the connections made.

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RESULTS AND DISCUSSION:

Thirty interviews were conducted with CNP employees across various position types, though most were in director-level positions (Table 1). There was representation from 21 states and each USDA region.

Table 1. *Demographics of Participants (n=30)*

Demographics of Participants	
Position Title	
Director or Assistant Director	22 (73%)
Dietitian	2 (7%)
Manager ("Cafeteria" and "Quality Control")	2 (7%)
Front-line Staff ("Head cook" and "school nutrition specialist")	2 (7%)
Nutrition Coordinator	1 (3%)
State Agency Director	1 (3%)
USDA[b] Region[c]	
Northeast (CT, ME, MA, NH, NY, RI, VT)	3 (10%)
Midwest (IL, IN, IA, MI, MN, OH, WI)	4 (13%)
Southwest (AZ, AR, LA, NM, OK, TX, UT)	8 (27%)
Southeast (AL, FL, GA, KY, MS, NC, SC, TN)	3 (10%)
Mid-Atlantic (DE, DC, MD, NJ, PA, PR, VA, WV)	1 (3%)
Mountain Plains (CO, KS, MO, MT, NE, ND, SD, WY)	5 (17%)
West (AK, CA, HI, ID, NV, OR, WA)	6 (20%)
Urbanicity[d]	
A large city	1 (3%)
A suburb near a large city	11 (37%)
A small city or town	10 (33%)
A rural area	6 (20%)
Did not report	2 (7%)

[a]COVID-19 = coronavirus disease 2019
[b]USDA = United States Department of Agriculture
[c]Postal abbreviations of states are included for each region
[d]Urbanicity was determined using the participants' zip codes (USDA, Economic Research Service, 2022)
[e]Participants marked all that applied

(Table 1 continues)

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Table 1 (continued). *Demographics of Participants (n=30)*

Demographics of Participants	
Meals/Snacks Served[e]	
Breakfast	28 (93%)
Lunch	28 (93%)
Supper	9 (30%)
Fresh Fruit and Vegetable Program (FFVP) Snack	7 (23%)
Super Snack	6 (20%)
Pre-Pandemic Free and Reduced Rate	
<25%	3 (10%)
25–50%	5 (17%)
51–65%	5 (17%)
>65%	4 (13%)
Not applicable or did not report	13 (43%)
Gender	
Female	25 (83%)
Male	3 (10%)
Did not report	2 (7%)
Race/Ethnicity	
White (non-Hispanic)	19 (63%)
White (Hispanic)	1 (3%)
Did not report	10 (33%)
Age	
Less than 30 years	1 (3%)
30–39 years	4 (13%)
40–49 years	8 (27%)
50–59 years	10 (33%)
60 years or older	4 (13%)
Did not report	2 (7%)

[a]COVID-19 = coronavirus disease 2019
[b]USDA = United States Department of Agriculture
[c]Postal abbreviations of states are included for each region
[d]Urbanicity was determined using the participants' zip codes (USDA, Economic Research Service, 2022)
[e]Participants marked all that applied

(Table 1 continues)

Table 1 (continued). *Demographics of Participants (n=30)*

Demographics of Participants	
Hours worked per week	
10–19 hours/week	1 (3%)
20–29 hours/week	0 (--)
30–39 hours/week	2 (7%)
40–49 hours/week	18 (60%)
Over 50 hours/week	7 (23%)
Did not report	2 (7%)

[a]COVID-19 = coronavirus disease 2019
[b]USDA = United States Department of Agriculture
[c]Postal abbreviations of states are included for each region
[d]Urbanicity was determined using the participants' zip codes (USDA, Economic Research Service, 2022)
[e]Participants marked all that applied

Three themes were identified through inductive qualitative analysis (Table 2): (1) innovation and uncertainty, (2) personal and staff well-being, and (3) supplies and sustainability. Themes are presented in order of prevalence based on the number of participants who contributed to the findings, then thematic content is applied within the framework of the JD-R Model to identify *job demands*, *strain reactions*, *job resources*, and *motivations*.

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Table 2. *Participant Experiences (*n*=30) in Child Nutrition Programs During School Year 2020–2021: Thematic Results from Qualitative Analysis*

Brief Theme Description	**Representative Quotes[a]**
Theme 1: Innovation During Uncertainty Participants indicated that the continued pandemic required additional innovation in adapting methods for feeding children. There was a general sense of uncertainty that occurred during School Year (SY) 2020–2021 and about the upcoming SY 2021–2022.	"There were many changes, different ways of doing things, changes of recipes, added rules and regulations for health and safety […], added safety for receiving, rolling quarantines causing us to move product from one school to another on a constant basis." (Dietitian, Mountain Plains) "Not completely knowing what CDC and our health department, state health department will be allowing for meal distribution, or best practices. We're imagining most of our students will be back in the classroom like they are now [in the 2021–2022 school year], but with that you know, like how much back to normal menus can we go?" (Nutrition Coordinator, Midwest) "The state level is kind of a stopping point for us to where you'll have the USDA announcement that school meals are going to be free for next year. And then it takes about two months before you're going to hear back from the state saying, 'Okay, Iowa has accepted this waiver, here's what we're going to do and so forth.' So, there's quite a bit of time. And parents are hearing about the USDA waiver two months prior to it before we can even make an announcement because the state is still in communication with trying to get this deciphered. So that brings on, you know, all new challenges." (Director, Midwest)

[a]Participant position titles and USDA geographic regions are listed parenthetically after quotations to provide context.

(Table 2 continues)

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Table 2 (continued). *Participant Experiences (n=30) in Child Nutrition Programs During School Year 2020–2021: Thematic Results from Qualitative Analysis*

Brief Theme Description	Representative Quotes[a]
Theme 2: Personal and Staff Well-being Participants explained that CNP employee well-being was positively influenced through support and recognition, and by being motivated to ensure that all children were fed through universal no cost meals during the 2020–2021 SY. However, participants explained that burnout, low wages, staff shortages, and lack of recognition were harming employee well-being.	"[It has been challenging] finding the stamina, the energy, the mental capacity to keep operating at the intensity that we've been having to operate under. I am a very optimistic, positive person. I love doing things for my staff. I fully embrace the part of my job that is the cheerleader and the motivator and those things. And the early days, you know, the first, oh, I would say six months, doing okay. Then it just started not being very fun for everybody [for her and staff]. Just the burnout level was high." (Director, Mountain Plains) "My team is still standing. We fed kids; we have broken records [in the number of meals served]. We've done it in the face of times where we could have just given up. …my team is just so good at what they do. They know what's expected and they just go get it done." (Director, West) "[The CNP employees are] not paid well, they work hard, they're not recognized [on School Lunch Hero day] … Why would they continue to work for $10 an hour? … They can't even get a diet Coke from the school with a little sticker on it that says, thank you, but you best believe the teachers got it. And we're, and great, they should… but all of my [employees], why couldn't they have it too. …We dove in and we've given us so much this school year and we've just gotten absolutely nothing in return, so it's just not worth it." (Director, Southwest)

[a]Participant position titles and USDA geographic regions are listed parenthetically after quotations to provide context.

(Table 2 continues)

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Table 2 (continued). *Participant Experiences (*n*=30) in Child Nutrition Programs During School Year 2020–2021: Thematic Results from Qualitative Analysis*

Brief Theme Description	**Representative Quotes[a]**
Theme 3: Supplies and Sustainability CNP employees explained that procurement of food and supplies was challenging throughout the 2020–2021 SY and they were worried that these issues would continue into the next SY. The adapted feeding approaches (e.g., packaging, food waste) were described as financially and environmentally unsustainable.	"The greatest challenge is probably the amount of waste that we've created. [Pre-pandemic] the school was 'zero waste' and during the pandemic we went to 100% waste." (Director, West) "It's expensive to buy food. The price of beef has gone up. The price of chicken has gone up. Individually wrapped products, those prices are skyrocketing, but if you buy the bulk and then individually wrap it, you've got to weigh the cost of that." (Director, Southwest)

[a]Participant position titles and USDA geographic regions are listed parenthetically after quotations to provide context.

Theme 1: Innovation During Uncertainty

All participants (*n*=30) shared their experiences initially navigating providing meals for children during COVID-19 and described how additional innovation was needed during SY 2020–2021—a period of constant change.

As students began returning to school in-person, many CNP employees packed and delivered food to students in physically distanced classrooms. Others had to navigate a return to congregate feeding, including extended service that would allow for "*staggered meal start times.*" Employees also had to find ways to feed quarantined students or students who opted to learn virtually. To manage the technical challenges of having multiple feeding sites running at once, some school districts used a tally-marking system to note how many students were eating. Additionally, participants innovated by utilizing various interactive platforms like social media pages to disseminate information and online software programs (e.g., Google forms) for meal sign-ups. While many participants felt supported by the flexibility that USDA waivers created, some noted that the paperwork was burdensome. Most participants (*n*=24) expressed uncertainty about the upcoming SY 2021–2022. Participants worried about what service model would be expected and had to patiently wait for guidance from their school district, USDA, or Centers for Disease Control and Prevention which created uncertainty about staffing and procurement needs. Participants expressed the need for backup plans and a hope for greater consistency.

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Theme 2: Personal and Staff Well-being

Participants (*n*=30) detailed how they and their staff's well-being was positively or deleteriously impacted during the pandemic. Participants' experiences were represented in three subthemes: (a) Exhaustion and burnout, (b) Motivated to feed children, and (c) Local support and recognition.

Exhaustion and Burnout. Collectively, participants explained that they felt safer during this school year compared to earlier in 2020, because they had adequate personal protective equipment (PPE) and there was consistency in mitigation strategies (e.g., physical distancing, temperature checks). However, participants (*n*=28) still used words like "*tired*," "*frustrated*," "*stressed*," "*overworked*," and "*burnout*" as they described their experience. Recruiting and retaining staff was a significant challenge, which contributed to increased workload for remaining employees, even requiring those in leadership positions to fill in at times. Participants attributed this difficulty to noncompetitive wages, and it was suggested that the USDA should increase reimbursement rates to elevate wages. Furthermore, amidst increased workloads, participants were also navigating their own family caregiving responsibilities, personal health, and grief/loss. Most were not relying on professional services, like therapy and counseling, to manage their stressors.

Motivated to Feed Children. Participants (*n*=30) explained that staff "*adaptability*," "*flexibility*," and "*resiliency*" during SY 2020–2021 ensured children were fed. Participants personally believed that all students should be fed, and this desire motivated their work. The implementation of universal, no cost meals during the pandemic was viewed positively. Moreover, participants were supportive of universal, no cost meals continuing post-pandemic. In general, participants reported that meeting school children's and community members' nutritional needs during the pandemic positively contributed to employee well-being.

Local support and recognition. Participants (*n*=30) shared their experiences receiving (or not receiving) support from their schools and communities. Participants explained that employees "*need and deserve recognition*" for their work and that this did/could enhance employee well-being. Some felt strong support, as community members donated time, money, PPE, and demonstrated gratitude.

Local school and district staff also volunteered to help. Some school districts even provided added pay or bonuses for CNP employees. Participants indicated that meaningful support could be small, but that missing opportunities to recognize CNP employees hurt morale and made employees feel "*dispensable*." Some participants explained that there were areas in which school districts and stakeholders could improve in terms of support and recognition. For example, participants shared that their stakeholders within their districts did not understand the lead times needed for meal forecasting, how budget changes influenced the ability to feed students, and how under-prioritizing needed equipment repairs disrupted feeding.

Theme 3: Supplies and Sustainability

Participants (*n*=27) shared the challenges of food/supply procurement and sustainable practices during SY 2020–2021. Procuring needed supplies was difficult due to vendor challenges and items were more expensive due to scarcity, limiting variety in meals served.

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Participants (*n*=18) also expressed concerns over the environmental impact of their production. More unrecyclable paper products were used, accompanied by unsustainable trash fees. Food waste was also a major concern. Forecasting for procurement and meal planning became increasingly difficult with frequent, sometimes "*overnight*" USDA changes. To adapt, many participants simplified their menus. Participants anticipated and worried about intensified supply chain shortages in SY 2021–2022.

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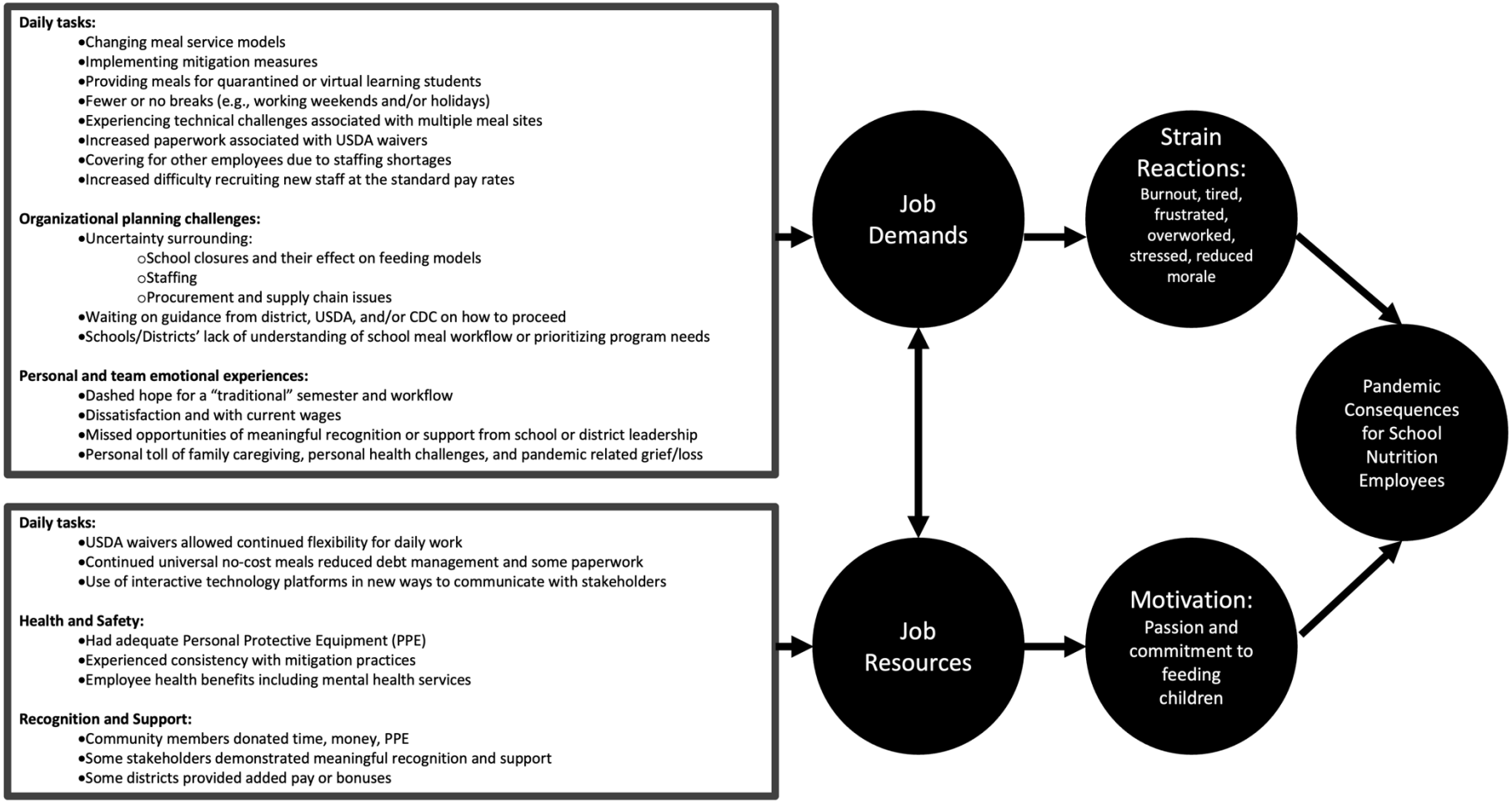
Figure 2. The Job-Demand Resource Model applied to Child Nutrition Program Employees' School Year 2020-2021 Experiences

This figure was adapted from Mojtahedzadeh et al. (2021) following permission requirements from MDPI Publishers.



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Application of JD-R Model

Researchers assessed how the content of these themes aligned with the JD-R Model, identifying *job demands, job resources, motivations,* and *negative strain reactions* experienced by participants (Figure 2).

Job Demands

Participants reported a variety of job demands, grouped into these categories: daily tasks, organizational planning challenges, and personal and team emotional experiences. The most significant job demands included supply chain issues, staffing and wages, and support and personal well-being.

Supply Chain. The SNA conducted a survey in October/November 2021 to explore how supply chain issues were affecting school meals; participants reported their top three challenges were unavailability of menu items, supplies/packaging materials, and discontinued food items (SNA, 2022b). The USDA responded in December 2021 by providing $1.5 billion in assistance, and later offered a nationwide waiver allowing flexibility with meal pattern violations for the SY 2022–2023 (Reisenger & Dhillon, 2022; USDA, 2022a; USDA, 2022b). Future research could explore the effectiveness of this approach, specifically if it has ameliorated supply chain challenges for management and frontline employees. In 2022, SNA and No Kid Hungry held listening sessions and reported possible solutions related to menu, procurement, and storage challenges shared by CNP operators. Ultimately, as child nutrition leaders prepare for future disaster responses, it is important to work with vendors and manufacturers to develop contingency plans for both short- and long-term supply chain issues.

Staffing and Wages. Participants described staffing concerns, including difficulty retaining and hiring employees, in part due to the low pay rates of the positions. According to SNA data from October/November 2021, staffing has remained a significant challenge; some school districts have responded by increasing pay (42%) and offering bonuses (18.7%) (SNA, 2022b). Gupta et al. (2025) also found these workforce challenges in their mixed-methods study with child nutrition directors in 2021.

Since the present study was conducted in April/May 2021, there have been record numbers of people quitting across all job types in the USA (Society for Human Resource Management, 2022). Further, the US Bureau of Labor Statistics (n.d.) reported that the average hourly pay rate for nonsupervisory foodservice employees increased from $13.74 in March 2020 to $15.17 in April/May 2021, and finally $17.24 in September of 2022. If pay for CNP jobs does not follow this growth trend, current and potential workers may opt out of them and into other higher wage foodservice jobs. For attraction and retention of CNP employees, increased attention and resources should be directed towards their total compensation including benefits.

Support and Personal Well-Being. Some participants described feeling unappreciated and unsupported by leaders in their schools, districts, and/or community members. Early in the pandemic, CNP employees reported feeling like their program's response "*helped alleviate the 'bad rep' and prior under-appreciation of the program*." Unfortunately, as the pandemic continued, this outside enthusiasm for school meals appeared to dampen. Participants highlighted reasonable actions that would make them feel supported, such as school

leaders coming in-person to visit the team or serve meals to students, being provided with a meal, or receiving a small gift. These small gestures may be part of a state, district, or school leadership team plan for employee retention.

Many participants expressed difficulties navigating work with personal demands and life responsibilities during the pandemic. Some were juggling family caregiving responsibilities, personal health challenges, and grief/loss associated with COVID-19. Although now dated, research on CNP employees in large school districts in the USA indicated that 88% of respondents (n=95) had access to Employee Assistance Programs (EAP) and 76.2% (n=80) had access to professional counseling, but very few actually took advantage of these benefits (16.8% used EAP, 11.3% used counseling) (Harrison, 2010). Ensuring CNP employees are aware of and know how to access EAP and/or health care benefits (including mental health services) could help them navigate difficulties presented by challenging or overwhelming situations.

Job Resources

Beyond job demands, participants described several pandemic-specific job resources, categorized into those related to daily tasks, health and safety, and recognition and support. Specifically, those most important to participants were flexibility and efficiency, safety, and support.

Flexibility and Efficiency. Innovation has been a significant element of the school meal program in response to the pandemic, since the beginning (Kinsey et al., 2020; Patten et al., 2021b). Participants reported appreciation for the continued flexibility of USDA waivers. The USDA offering, renewing, and adjusting these waivers will be a useful job resource for future emergency responses. Additionally, participants spoke positively about universal, no-cost meals for children and reported that implementation decreased the amount of paperwork and debt management they did which provided further evidence supporting advocacy efforts for *Healthy School Meals for All* (Academy of Nutrition and Dietetics, 2022). Participants also described using technology to support their innovative pandemic response and increase their efficiency. Most of these technologies were free and included QR codes and Google applications. Ensuring these employees have needed devices and access to practical training on how to use these technologies could continue to serve as job resources for these employees.

Safety. Earlier in the pandemic, PPE was less and/or inconsistently available for CNP employees (Patten et al., 2021a; Patten et al., 2021b). Participants in the present study were relieved to have consistent access to PPE and were more aware of virus mitigation practices. Feeling safe at work is an important job resource, particularly during a pandemic.

Support. Participants had mixed experiences with feeling supported by key stakeholders as discussed earlier. Four participants were using mental health counselors to help them manage pandemic-related stressors. Some even worked to connect their employees to these resources. Again, introducing CNP employees to mental health resources available through employee insurance benefits or EAPs could be helpful.

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Motivation and Negative Strain Reactions

Child Nutrition Program employees historically demonstrate high commitment to their work and even during the early onset of the pandemic they reported job satisfaction (Harrison, 2010; Patten et al., 2021a). In the present study, participants again described being motivated by their passion for and commitment to feeding children, which aligns with findings from earlier studies in the pandemic (Katz et al., 2022; Patten et al., 2021b). This altruistic effort is important as it appears to be a durable motivating force and can contribute to increased work engagement and performance (Bakker & Demerouti, 2007). Finding ways to recruit and select future employees who share this commitment may boost employee retention and satisfaction.

Importantly, participants emphasized the *negative strain reactions* they were experiencing such as burnout, exhaustion, decreased morale, stress, and being overworked which suggests that the health impairment process, as described in the JD-R Model, was occurring (Bakker & Demerouti, 2007). These employees were experiencing chronic, pandemic-related *job demands* that were negatively impacting their health and well-being. Reducing pandemic-specific *job demands* and increasing *job resources* may help reduce these *negative strain reactions* for CNP employees.

There are limitations to this study. As the pandemic continued, there were unique challenges at different times based on geography. We attempted to address this by including representation from 21 states, but disproportionate representation across USDA regions is a study limitation. Nonresponse to the recruitment survey from all CNP staff is also a limitation. Additionally, this study focused specifically on the experiences of CNP employees and did not have representation from vendors, USDA staff, non-meal school leaders/employees, or families. Finally, this sample consisted predominantly of white women; future research should explore the experiences of underrepresented demographic groups within the industry.

CONCLUSIONS AND APPLICATION:

Child nutrition employees play an important role in the provision of school meals –continuing to assess their experience throughout the pandemic is beneficial for understanding how to both support the current workforce and be prepared for future emergency responses. In this study, participants described their experiences during SY 2020–2021 and researchers then applied the JD-R model to the qualitative analysis results to identify *job demands, job resources, motivations,* and *negative strain reactions* experienced.

Overall, study findings suggest there may be opportunities to leverage *job resources* and manage *job demands* for the CNP workforce during ongoing emergency responses, to ensure employee retention and well-being. Reducing *job demands* may involve advocacy for higher reimbursement rates to increase wages consistent with national growth trends, connecting employees to mental health support, recognizing employee contributions with meaningful gestures, and supporting flexibility in developing contingency plans to navigate supply chain issues. As significant job demands are relieved, the health impairment process is interrupted upstream, reducing the likelihood of *negative strain reactions* like burnout and stress.

Magnifying *job resources* may involve making helpful technology accessible, prioritizing employee safety, and supporting policy initiatives such as USDA waivers and universal no-cost meals. This allows child nutrition employees to have the flexibility to innovate in the face of uncertainty. Employees were primarily motivated by a passion for children's nutrition; hiring staff who share this commitment may maximize retention and performance. The COVID-19 pandemic has subsided in many ways, while unique challenges for the CNP workforce are being revealed. Because these employees are vital to the functioning of CNPs, future research should continue exploring employees' experiences as the industry responds to other emergencies and adapts to unique conditions.

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ABSTRACT

PURPOSE/OBJECTIVES

The purpose of this study was to explore the work experiences of Child Nutrition Program (CNP) employees during School Year (SY) 2020–2021 through the lens of the Jobs Demands-Resources (JD-R) Model to provide insight into opportunities for increasing *job resources*, managing *job demands*, understanding *motivation*, and reducing *negative strain reactions*.

METHODS

As part of a national survey of child nutrition employees, participants were able to indicate interest in completing an interview about their experience during COVID-19. Thirty participants, holding various titles and job responsibilities in CNPs, were interviewed between May and June, 2021 across the United States. An inductive qualitative codebook thematic analysis was completed, with results triangulated to the JD-R Model.

RESULTS

Participants discussed their experiences working during SY 2020–2021 and three themes were detected: (1) innovation and uncertainty, (2) personal and staff well-being, and (3) supplies and sustainability. In applying the JD-R Model to the results, multiple *job demands* surfaced related to changes in daily tasks, organizational planning challenges, and the personal/team emotional experiences. Further, *job resources* across themes also existed, including those associated with how daily tasks, health/safety, and recognition/support were managed. Participants were *motivated* by their passion for feeding children and experienced *negative strain reactions* like burnout, frustration, and decreased morale.

APPLICATIONS TO CHILD NUTRITION PROFESSIONALS

Findings from this study identified CNP employees experienced significant *job demands* during SY 2020–2021 including perceived staffing problems, low compensation, need for mental health support, desire for recognition, and support in navigating the supply chain issues. Leaders of CNPs may prioritize addressing these *job demands* to retain and attract qualified and motivated child nutrition employees.

SCHOOL NUTRITION ASSOCIATION

REFERENCES

Academy of Nutrition and Dietetics. (2022, July 15). *The Academy of Nutrition and Dietetics' Priorities for the White House Conference on Hunger, Nutrition and Health.* https://www.eatrightpro.org/news-center/public-policy-news/key-policy-priorities-in-recommendations-for-white-house-conference

Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of Managerial Psychology, 22*(3), 309–328. doi: 10.1108/02683940710733115

Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: taking stock and looking forward. *Journal of Occupational Health Psychology*, *22*(3), 273. doi: 10.1037/ocp0000056

Barello, S., Caruso, R., Palamenghi, L., Nania, T., Dellafiore, F., Bonetti, L., Silenzi, A., Marotta, C., & Graffigna, G. (2021). Factors associated with emotional exhaustion in healthcare professionals involved in the COVID-19 pandemic: An application of the job demands-resources model. *International Archives of Occupational and Environmental Health*, *94*(8), 1751–1761. doi: 10.1007/s00420-021-01669-z

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. doi: 10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health, 11*(4), 589–597. doi: 10.1080/2159676X.2019.1628806

Braun, V., Clarke, V., Hayfield, N., & Terry, G. (2019). Thematic analysis. In P. Liamputtong (Ed.), *Handbook of research methods in health social sciences*. Springer Nature Singapore Pte Ltd. doi: 10.1007/978-981-10-5251-4_103.

Braun, A., Hawley, J. D., & Garner, J. A. (2022). Maintaining school foodservice operations in Ohio during COVID-19: "This [was] not the time to sit back and watch." *International Journal of Environmental Research and Public Health, 19*(10), 5991. doi: 10.3390/ijerph19105991

Bradbury-Jones, C., Herber, O. R., Miller, R., & Taylor, J. (2022). Improving the visibility and description of theory in qualitative research: The QUANTUM typology. *SSM – Qualitative Research in Health, 2*. doi: 10.1016/j.ssmqr.2021.100030

Centers for Disease Control and Prevention. (2021, November 15). *Modifying school spaces during mealtimes to reduce spread of COVID-19.* CDC Archive. https://www.cdc.gov/healthyschools/covid/safely-distributing-meals.html

Creswell, J. W. (2013). *Qualitative inquiry and research design.* Sage Publications.

Demerouti, E., & Bakker, A. B. (2023). Job demands-resources theory in times of crises: New propositions. *Organizational Psychology Review*, *13*(3), 209–236.

Do, D. P., & Frank, R. (2021). US frontline workers and COVID-19 inequities. *Preventative Medicine, 153*, 106833. doi: 10.1016/j.ypmed.2021.106833

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods, 5*(1), 80–92. doi: 10.1177/160940690600500107

Fife, S. T., & Gossner, J. D. (2024). Deductive qualitative analysis: Evaluating, expanding, and refining theory. *International Journal of Qualitative Methods*, *23*. doi: 10.1177/16094069241224485 6

Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2012). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods, 16*(1), 15–31. doi: 10.1177/1094428112452151

Gupta, K., PMP, L. L., & Mann, G. (2025). Challenges and Successes for School Child Nutrition Directors during the COVID-19 Pandemic: A Mixed-Methods Study. *Journal of Child Nutrition & Management*, *49*(1), n1.

Harrison, M. K. (2010). *Work/life practices and the recruitment and retention of large school districts' foodservice professionals.* [Doctoral dissertation, Iowa State University]. https://dr.lib.iastate.edu/server/api/core/bitstreams/1d78d4f4-7ec5-491f-8756-b4015c631ee7/content

Jowell, A. H., Bruce, J. S., Escobar, G. V., Ordonez, V. M., Hecht, C. A., & Patel, A. I. (2021). Mitigating childhood food insecurity during COVID-19: A qualitative study of how school districts in California's San Joaquin Valley responded to growing needs. *Public Health Nutrition, 26*(5), 1063–1073. doi: 10.1017/S1368980021003141

Katz, B. N., Soldavini, J., Grover, K., Jilcott Pitts, S., Martin, S. L., Thayer, L., Ammerman, A. S., & Lane, H. G. (2022). "Let's use this

mess to our advantage": Calls to action to optimize school nutrition program beyond the pandemic. *International Journal of Environmental Research and Public Health, 19*(13), 7650. doi: 10.3390/ijerph19137650

Kenney, E. L., Dunn, C. G., Mozaffarian, R. S., Dai, J., Wilson, K., West, J., Shen, Y., Fleischhacker, S., & Bleich, S. N. (2021). Feeding children and maintaining food service operations during COVID-19: A mixed methods investigation of implementation and financial challenges. *Nutrients, 13*(8), 2,691. https://doi.org/10.3390/nu13082691

Kinsey, E. W., Hecht, A. A., Dunn, C. G., Levi, R., Read, M. A., Smith, C., Niesen, P., Seligman, H. K., & Hager, E. R. (2020). School closures during COVID-19: Opportunities for innovation in meal service. *American Journal of Public Health, 10*(11), 1635–1643. doi: 10.2105/AJPH.2020.305875

Krueger, R. A., & Casey, A. (2020). *Focus groups: A practical guide for applied research (3rd ed.).* Sage Publications.

Mojtahedzadeh, N., Wirth, T., Nienhaus, A., Harth, V., & Mache, S. (2021). Job demands, resources and strains of outpatient caregivers during the COVID-19 pandemic in Germany: A qualitative study. *International Journal of Environmental Research and Public Health, 18*(7), 3684. doi: 10.3390/ijerph18073684

Nadin, S., & Cassell, C. (2004). Using data matrices. In C. Cassell & G. Symon (Eds.), *Essential guide to qualitative methods in organizational research* (271–274). Sage Publications.

Patten, E. V., Beckstead, E., Jones, M., Spruance, L. A., & Hayes, D. (2021a). School nutrition professionals' employee safety experiences during the onset of the COVID-19 pandemic. *Journal of Nutrition Education and Behavior, 53*(1), 2–9. doi: 10.1016/j.jneb.2020.10.021

Patten, E. V., Spruance, L., Vaterlaus, J. M., Jones, M., & Beckstead, E. (2021b). Disaster management and school nutrition: A qualitative study of emergency feeding during the COVID-19 pandemic. *Journal of the Academy of Nutrition and Dietetics, 121*(8), 1441-1453. doi: 10.1016/j,jand.2021.04.012

Reisinger, L., & Dhillon, S. (2022). Disrupted Food Supply Chain's Effect on School Nutrition Programs' Ability to Meet USDA Nutritional Guidelines During the COVID-19 Pandemic. *Journal of Child Nutrition and Management*, *46*.

Rosemberg, M. A. S., Adams, M., Polick, C., Li, W. V., Dang, J., & Tsai, J. H. (2021). COVID‐19 and mental health of food retail, food service, and hospitality workers. *Journal of Occupational and Environmental Hygiene, 18*(4–5), 169–179. doi: 10.1080/15459624.2021.1901905

School Nutrition Association. (2022a, April). *Impact of COVID-19 on school nutrition programs: Part 2*. https://schoolnutrition.org/wp-content/uploads/2022/04/COVID-19-Impact-on-School-Nutriction-Programs-Part2.pdf

School Nutrition Association. (2022b, May). *2021 supply chain survey report: A summary of survey results.* https://schoolnutrition.org/uploadedFiles/News_and_Publications/Press_Releases/Press_Releases/2021-Supply-Chain-Survey-Report.pdf

School Nutrition Association, School Nutrition Foundation, No Kid Hungry. (2022, July). *Staying afloat in a perfect storm: The K-12 school nutrition segment contends with historic supply challenges.* https://schoolnutrition.org/wp-content/uploads/2022/07/Jul22-SupplyChainReport.pdf

School Nutrition Association. (2025). *SY 2024/25 School Nutrition Trends Report* [PDF]. https://schoolnutrition.org/wp-content/uploads/2025/01/2024-25-School-Nutrition-Trends-Report.pdf

Society for Human Resource Management. (2022, March 9). *Interactive chart: How historic has the Great Resignation been?* https://www.shrm.org/resourcesandtools/hr-topics/talent-acquisition/pages/interactive-quits-level-by-year.aspx

Sokal, L. J., Eblie Trudel, L. G., & Babb, J. C. (2020). Supporting teachers in times of change: The job demands-resources model and teacher burnout during the COVID-19 pandemic.

US Bureau of Labor Statistics. (Sept 15, 2025) *Average hourly earnings of production and nonsupervisory employees, food services and drinking places, not seasonally adjusted.* https://data.bls.gov/timeseries/CEU7072200008?amp%253b data_tool=XGtable&output_view=data&include_graphs=true

US Department of Agriculture. (2022a, March 3). *USDA No. 0273.21*. https://www.fns.usda.gov/news-item/usda-0273.21

US Department of Agriculture, Economic Research Service. (2022). *Rural-Urban Commuting Area Codes*. https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes

US Department of Agriculture, Food and Nutrition Service. (2019, April). *School nutrition and meal cost study summary of findings*. https://fns-prod.azureedge.us/sites/default/files/resource-files/SNMCS_Summary-Findings.pdf

US Department of Agriculture, Food and Nutrition Service. (2022b, June 22). *Child Nutrition Response #110*.

https://www.fns.usda.gov/cn/covid-19-child-nutrition-response-110

US Department of Agriculture, Food and Nutrition Service. (2023, November 8). *Child nutrition COVID-19 waivers.* https://www.fns.usda.gov/fns-disaster-assistance/fns-responds-covid- 19/child-nutrition-covid-19-waivers

Zhou, T., Xu, C., Wang, C., Sha, S., Wang, Z., Zhou, Y., Zhang, X., Hu, D., Liu, Y., Tian, T., Liang, S., Zhou, L., & Wang, Q. (2022). Burnout and well-being of healthcare workers in the post-pandemic period of COVID-19: a perspective from the job demands-resources model. *BMC health services research*, *22*(1), 284.

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Is There Any Association Between U.S. Children Produce Intake and School Grade Groups?

- Prabhdeep Sandha, PhD, RDN, David H. Holben, PhD, RDN, LD, FAND and Yunhee Chang PhD

KEYWORDS: School meals, School grades, Produce intake, Fruit, Vegetables, NSLP

INTRODUCTION:

About 30 million school children consumed school meals in the school year 2018–19. The school meals are subsidized by the U.S. government to provide free or reduced-price meals to millions of vulnerable children. School children participate in different food assistance programs to acquire and supplement their food. Some of the prominent Federal programs that provide food and nutrition education assistance to children are SNAP (Supplemental Nutrition Assistance Program), Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and National School Lunch Program (NSLP). NSLP and WIC are targeted primarily towards infants and children (Jones et al., 2025). In 2024, the NSLP and related child nutrition programs (including School Breakfast Program, Child and Adult Care Food Program, and Summer Food Service Program) served 9.3 billion meals, a 4% increase from the previous year. In 2014, 5.1 billion lunches were served under the NSLP program, with over 70% were provided free or reduced-price meals (U.S. Department of Agriculture, Food and Nutrition Services, 2020d).

Since the 2010 Healthy, Hunger-Free Kids Act (HHFKA), meal patterns have emphasized fruit and vegetable variety across distinct grade groups (K–5, 6–8, and 9–12). Yet, little is known about whether these structural changes have translated into measurable differences in children's actual produce intake. Therefore, it is pertinent to look at national trends to assess if a child's grade group is related to diet quality. One of the many other changes that came with HHFKA policy implementation was an increased requirement for fruits and vegetables served in school. Not only this, but the type of vegetables offered was also influenced by HHFKA. In addition, HHFKA mandated that maximum and minimum number of meals be served based on the Recommended Dietary Allowances (RDA) for each grade group (K–5, 6–8, 9–12) (Bergman, Englund, et al., 2014; Hager & Turner, 2016; U.S. Department of Health and Human Services & U.S. Department of Agriculture, 2015; U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2020; U.S. Department of Agriculture, Food and Nutrition Service, 2016). Updating nutritional standards put forth by the U.S. Department of Agriculture, Food and Nutrition Service, in NSLP meal pattern identifies specific nutritional requirements of different grade groups (Hayes et al., 2018). Pèrez and colleagues assessed differences in dietary intake and meal patterns by grade among Texas school children (Pérez et al., 2007) to assess trends in food intake as well as preferences as it relates to various food groups. According to the U.S. Department of Agriculture, Economic Research Service (USDA ERS) (2024), school meals have shown improved nutritional quality compared to other food sources, especially following policy changes of HHFKA (U.S. Department of Agriculture, Economic Research Service, 2024). The food choices of children are constantly evolving. As children grow older, their food

choices tend to change; thus, it is essential to have readily available information to develop needs assessment or intervention specific to the child's age and grade. These studies demonstrate younger and older students have distinct eating behaviors. It is imperative to have early and constant exposure to all food groups in order to normalize fruit and vegetable acceptance among school-aged children/adolescents. Age is a significant predictor of eating patterns. Also, preschoolers who are picky and fussy eaters tend to have worse food choices, especially low vegetable intake, when they get older (Caton et al., 2014). Also, the USDA ERS report of 2024 concludes that fruit and vegetable intake declines with age, and older students are less likely to participate in school meal programs, especially breakfast, and consume more fast food, sugar, and sweetened beverages. This aligns with theories on behavioral development, food preference formation, and environmental influences, especially social cognitive theory (Bandura, 2012). USDA ERS also notes persistent disparity in fruit and vegetable intake by gender and race/ethnicity (U.S. Department of Agriculture, Economic Research Service, 2024). This helps identify age-specific nutritional gaps.

It is essential to look at national trends to assess if age-grade group and diet quality are related to each other among children. Please note that age/development stages are being used as a proxy for grade groups. NSLP participation is confirmed for each child; however, it is unknown if the student participating as elementary-/middle-/high-school was correctly identified. Therefore, there may be some students who may have been incorrectly classified, given age is used as a proxy for grade groups. This information is of considerable interest to researchers, policymakers, and advocates of public health and nutrition. The purpose of this study was to examine whether differences exist in U.S. children's produce intake across grade level/NSLP meal pattern groups [elementary/K–5 grades), middle/6–8 grades), high-school/9–12 grades)], while controlling for race and family income-to-poverty ratio. Specifically, this study explored whether there are differences among children's grade levels in:

a) child produce intake diet density estimated using a Healthy Eating Index (HEI) component score; and
b) child produce intake diet ratio estimated using the Recommended Intake (RI) based on the Dietary Guidelines for Americans (DGA) for respective age-gender-activity groups.

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METHODOLOGY:

Study Design

NHANES records cross-sectional data in two-year cycles. The data for this study came from three NHANES cycles, 2009–10, 2011–12, and 2013–14. All study protocols of NHANES were reviewed and approved by the NCHS Research Ethics Review Board (Centers for Disease Control and Prevention, 2025). Institutional Review Board (IRB) at the XXX also approved this study as exempt.

Sample/Setting

Four components of the household questionnaire were screener, relationship, sample participant, and family. After collecting the household interview, data collection took place in Mobile Examination Center (MECs), which included demographic, dietary, and questionnaire (Centers for Disease Control and Prevention, 2025). Dietary interview consisted of two-day 24-hour dietary interview; the first day 24-hour recall was conducted in the MEC, and second-day dietary interview was conducted after the MEC visit, through a telephone follow-up about 3-10 days after MEC visit, also called post-MEC activities. The dietary interview includes the Automated Multi-Pass Method (AMPM), which provides complete and accurate diet recall and reduces interviewer and respondent burden (Centers for Disease Control and Prevention, 2025; U.S. Department of Agriculture, Agricultural Research Service, 2019). NHANES utilized a proxy interviewee, who is preferably the person responsible for preparing a child's meals. A proxy or assisted interview was conducted if the child was less than six years of age. A child aged 6–11 years was asked to provide their own data, who may be accompanied by an adult household member. The child was the main responder if they were 11 years or older (Centers for Disease Control and Prevention, 2010). As previously noted, age/development stages are being used as a proxy for grade groups. NSLP participation is confirmed for each child; however, it is unknown if the student participating as elementary-/middle-/high-school was correctly identified. Therefore, there may be some students who have been incorrectly classified, given that age is used as a proxy for grade groups. Participants provided consent or assent to participate after they understood the entire NHANES process. The average response rate for participants was 82.5% in survey cycle 2009–14 (Centers for Disease Control and Prevention, 2020b).

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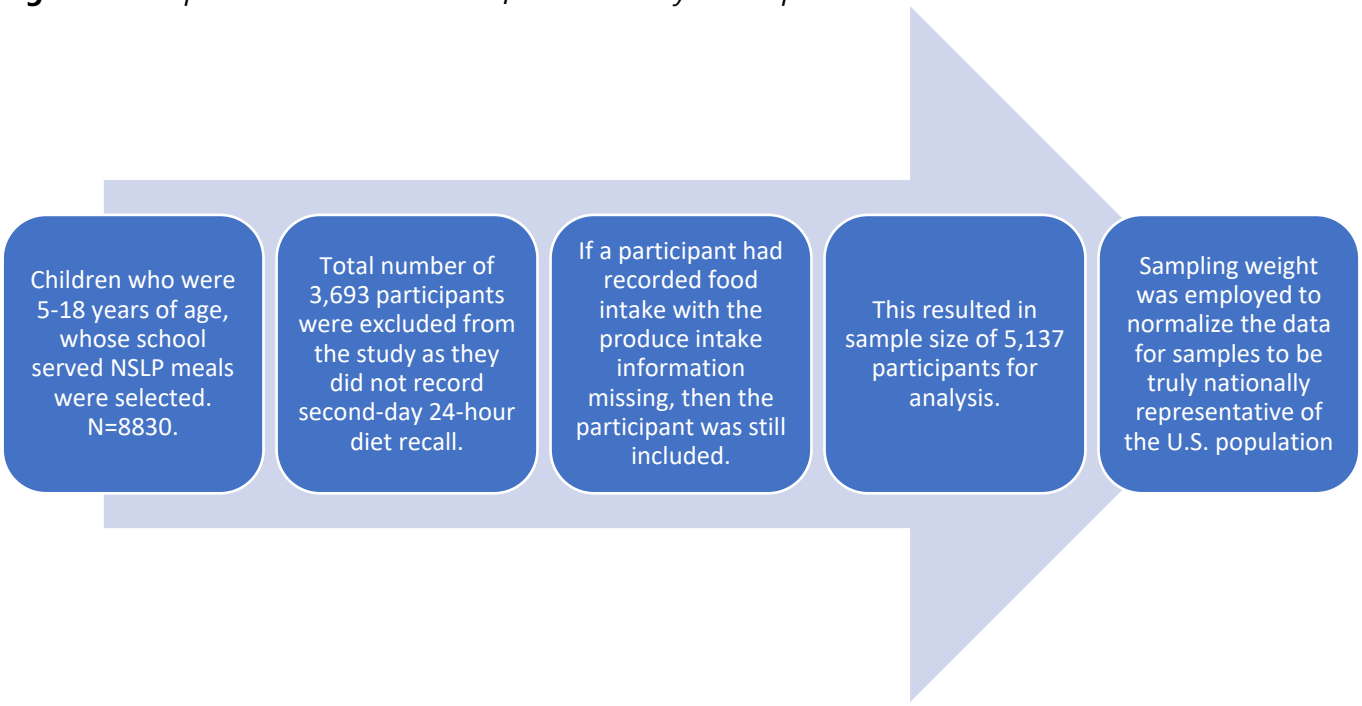
Analytic Sample

We employed inclusion and exclusion criteria using the following steps:

Figure. *Participant Selection Flowchart for Final Analytic Sample*



We selected children who were 5–18 years of age, whose school served NSLP meals. A total of 3,693 participants were excluded from the study as they did not record the second-day 24-hour diet recall. If a participant recorded food intake but had missing produce intake information, the participant was included. These exclusions resulted in a sample of 5,137 participants for analysis. Sampling weight was employed to normalize the data for samples to be truly nationally representative of the U.S. population (Centers for Disease Control and Prevention, 2025).

Instruments and Measures

NHANES: Dietary and Questionnaire Data

The questionnaire data were utilized, which included demographic, sociocultural, dietary intake, participation in school meal questions, and physical activity. The average of two-day 24-hour recall was used to estimate the quantity and quality of different types of foods and beverages consumed. Day one 24-hour recall is collected in-person, and the data is meant to be collected for the day before the data collection day, and day 2 dietary recall is collected 3–10 days later in the form of a phone interview. The benefit of using the average of two-day 24-hour recalls is that it is more representative, smooths out random fluctuations, reduces measurement error and improves group-level estimation of the population. External datasets, the What We Eat In America

(WWEIA) and the Food and Nutrient Database for Dietary Studies (FNDDS), are collected by the USDA and the U.S. Department of Health and Human Services (DHHS) and include detailed information on USDA food codes. These food codes, when combined with NHANES, gave dietary intake information (Centers for Disease Control and Prevention, 2020d; U.S. Department of Agriculture, Agricultural Research Service, 2019).

Healthy Eating Index

HEI-2015, a validated measure to estimate diet quality, was utilized in this study (Kirkpatrick et al., 2018; Reedy et al., 2018). Of the thirteen HEI components, the four (total fruits, total vegetable, whole fruits, and greens and beans) related to produce intake were utilized in the study, all scored from 0 to 5, where 0 means no consumption, and 5 means the consumption meeting the DGA's age-specific recommended intake (for example, score of 5 for Total Fruit will be achieved when ≥0.7 cup equivalent per 1,000 Kcal is consumed; for whole fruit, ≥0.3 cup equivalent per 1,000 Kcal is consumed; for Total Vegetables, ≥0.9 cup equivalent per 1,000Kcal is consumed) (Guenther et al., 2013; Kirkpatrick et al., 2018; National Cancer Institute, 2019; U.S. Department of Agriculture, 2019a). Appendix 2 depicts HEI-2015 components and scoring standards.

Recommended Intake (RI%)

The RI% is expressed as the percentage of a nutrient's recommended intake that an individual or population actually consumes. It is calculated by dividing the amount of the nutrient consumed by the recommended intake level (while controlling for age, gender, and activity level) and multiplying by 100. This metric allows researchers to evaluate whether dietary intake meets, exceeds, or falls short of established nutritional guidelines. Recommended intakes were calculated from 2015 DGAs. RI% was estimated using the formula:

$$Recommended\ Intake\ \% = \frac{Consumed\ equivalents}{\text{Recommended } equivalents} \times 100$$

RI% was calculated using DGA standards and comparing the actual, per participant intake by averaging a participant's 2-day, 24-hour recall provided through the WWEIA dataset per participant.

> The recommended intake values vary by age, gender, and activity level. Several questions assess the physical activity behavior of the participants. For the age group 11 years or younger, if the participants were physically active all seven days for at least 60 minutes, they were categorized as a vigorous/high activity group; otherwise, they were categorized as sedentary. Participants who were 12 years or older were categorized into three different activity levels: vigorous-intensity, moderate-intensity, and sedentary. Children in the vigorous-intensity group were involved in vigorous-intensity activities such as paid or unpaid work, studying or training, household chores, yard work, sports, fitness, and other recreational activities for at least 10 minutes continuously, requiring hard physical effort and causing a significant increase in breathing or heart rate. Further, children were categorized in the moderate-intensity group if their work included moderate-intensity work, sports, fitness, or recreational activity that causes a slight increase in breathing or heart rate, such as brisk walking, carrying light loads,

bicycling, swimming, or golf, for at least 10 minutes. Lastly, children were categorized as sedentary if they sat at work, at home, getting to and from places, traveling in a car or bus, reading, playing cards, watching television, or using a computer, not including time spent sleeping. If children did not spend at least 10 minutes doing vigorous- or moderate-intensity work, they were categorized as sedentary (Centers for Disease Control and Prevention, 2020a, 2020c; National Health and Nutrition Examination Survey, 2011; Sisson et al., 2009). Based on a participant's age, gender, physical activity, and energy requirement, the required produce intake (in cup equivalents per day) was calculated (U.S. Department of Health and Human Services & U.S. Department of Agriculture, 2015).

Regression Equation

Outcome_i = B0 + B1 MF_2_i+ B2MF_3_i + BX_i + Ɛ_i,
where outcomes were HEI fruit, HEI vegetable, HEI whole fruit, and HEI greens and beans; RI fruit and RI vegetable; B_1, B_2 are coefficients; MF_2 and MF_3 are predictor variables.

Variables and Covariates

The following variables and covariates were utilized:

1) One discrete predictor: school age-grade groups/NSLP meal pattern groups,
2) multiple continuous dependent variables: HEI and RI;
3) covariates: race (Mexican American/ Other Hispanic/ Non-Hispanic white/ Non-Hispanic Black/ Other races (including mixed races)) and family income-to-poverty (ratio of family income-to-poverty categories of <130%, 130–185%, and > 185%) were included.

Data Analyses

Stata/IC was used to tabulate data and conduct analyses (StataCorp, 2025). Descriptive statistics were reported to summarize the demographic qualities of participants. A *p*-value of less than .05 was utilized to identify statistical significance. Ordinary least squares (OLS) regression was conducted, followed by post-estimation tests. The Chi-squared analysis was utilized to test whether the recommended fruits and vegetables were met or not met. Dietary day-two sample weight for each survey cycle was applied before the analysis.

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RESULTS AND DISCUSSION:

Participants (n=5,137) were 11±4 years of age. Participants were predominantly Non-Hispanic White (n=1,418/5,137, 27.60%), male (n=2,588/5,137, 50.38%), family income-to-poverty ratio of 2±1.6. The descriptive statistics for the covariates and outcome variables are reported for different school grade groups in Tables 1 and 2. Table 3 presents OLS regression results on produce intake dietary intake quality. Table 3 shows that HEI fruit, HEI vegetable, HEI whole fruit, RI fruit, and RI vegetable were significantly different across the three grade groups. Compared to those in elementary school, middle and high school children demonstrated differences in produce-related diet quality. Table 4 describes whether fruit and vegetable intake was adequate and met the recommendations.

In the final step of analysis, a postestimation test was performed. The postestimation test (B1=B2?) showed a difference in HEI fruit, HEI whole fruit, and RI fruit. B1-B2(HEI fruit), F(1,4803)= 11.76***, B1-B2(HEI whole fruit), F(1,4803)= 19.48***, and B1-B2(RI fruit), F(1,4771)= 6.67**. Upon running OLS regression, when comparing middle- to high-school students, HEI fruit [t=-3.43, $p<.01$, Coeff= -0.39(0.11)]; HEI whole fruit [t=-4.41, $p<.001$, Coeff= -0.54(0.12)]; and RI fruit [t=-2.58, $p<.01$, Coeff= -10.17(3.94)] was lower in high-school students when compared to middle-school students.

For HEI fruit, when comparing elementary to middle school students, there was a 0.42 units decrease, and when comparing elementary to high school students, there was a 0.81 decrease, holding all other variables constant. For HEI vegetables, when comparing elementary to middle school students, there was a 0.15 units increase, and when comparing elementary to high school students, there was a 0.18 units increase, holding all other variables constant. For HEI whole fruit, when comparing elementary to middle school students, there was a 0.31 units decrease, and when comparing elementary to high school students, there was a 0.81 unit decrease, holding all other variables constant. For RI fruit, when comparing elementary to middle school students, there was a 21.86 units decrease, and when comparing elementary to high school students, there was a 32.04 units decrease, holding all other variables constant. For RI vegetable, when comparing elementary to high school students, there was a 4.85 units decrease, holding all other variables constant.

Findings from this study suggest that there were differences in diet quality when comparing school age-grade groups/NSLP meal pattern groups. Fruit intake diet quality (HEI fruit and HEI whole fruit) was found to be better in elementary school children than middle- and high-school students. However, diet quality in terms of HEI vegetable was better in the middle- and high-school students when compared to elementary school children. In terms of RI vegetable, when accounting for age-gender-activity level, it was found to be better in elementary school children in comparison to high school students. When comparing HEI fruit, HEI whole fruit, and RI fruit, fruit intake diet quality was estimated to be better in middle school students when compared to high school students. Therefore, this study confirms that there were significant grade-based differences in student diet quality, including HEI fruit, HEI whole fruit, HEI vegetable, and RI vegetables. Unexpected finding of this research is connected to HEI vegetable, where older students (middle- and high-schoolers) are observed to be having better HEI score as compared to elementary school students, which is in contrast to findings of

previous studies which indicate that older students generally have worse HEI scores (Caton et al., 2014; Pérez et al., 2007). However, USDA (2023) HEI 2015 report shows similarities of findings to our study with older children depicting better vegetable intake.

Previous results, as investigated by Pèrez and colleagues as well as Caton and colleagues, found differences in dietary intake and meal pattern by age-grade groups. Food choices of children constantly evolve; As children grow older, their food choices tend to change (Caton et al., 2014; Pérez et al., 2007). Lorson and colleagues (2009) show that younger children (2–5 years) are more likely to have a higher intake of fruits and vegetables than older children (6 to 18 years old) (Lorson et al., 2009). Contrary to the findings of Lorson and colleagues, we found that the diet quality of middle- and high-school students in terms of HEI vegetable was better when compared to elementary school children. Our findings align with previous research on fruit intake, where younger children have better HEI fruit, HEI whole fruit, RI fruit, and RI vegetable intake. It is, therefore, important to have readily available information about the eating patterns of children in different age-grade groups to develop interventions specific to children's age and grade. This study provides this information related to produce intake diet quality of children in different age- grade groups in a nationally representative population.

Age is a significant predictor of eating preferences. Preschoolers who are picky and fussy eaters tend to have worse food choices, especially low vegetable intake, when they get older (Caton et al., 2014). If child nutrition professionals have a better idea about the eating patterns of school-aged children, they can better plan and execute effective produce-related interventions for specific age-grade groups. This study helps to bridge produce related diet quality of children in different age-gender groups.

Considering produce intake recommendations, as mentioned in DGAs, in general, it was found that the majority of school students do not meet their fruit and vegetable intake. We also found similar findings related to school-aged children not meeting their recommended intake levels (Table 4). We found that only about 30% of elementary students, 18% of middle school students and 14% of high school students are meeting their fruit recommendations. Also, shockingly, only about 2% elementary students, 3% of middle-school students and 2% of high school students meet their vegetable recommendations.

Specifically, a higher percentage of high school students (86.13%) in comparison to middle (82.40%) and elementary school students (70.32%) were not meeting fruit recommendations. For vegetable intake, all three grade groups, i.e., high (97.72%), middle (97.40%), and elementary school students (97.63%), have an almost similar percentage of not meeting the recommendations.

Although using NHANES renders limitations such as the inability to establish causation, the cross-sectional nature of NHANES can help to establish correlation instead. Dietary intake, physical activity, and some health behaviors are self-reported; therefore, these findings may be subject to recall bias and social desirability bias. There are many advantages of using NHANES, including a large sample size and various variables, which help to account for various factors, thus strengthening the analysis.

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CONCLUSIONS AND APPLICATION:

The key findings from this study are that the HEI fruit, HEI whole fruit, and RI fruit were better in elementary school children when compared to middle- and high-school students. RI vegetable was better in elementary school children when compared to high school students. No differences were found in HEI greens and beans. Also, HEI fruit, HEI whole fruit, and RI fruit are better in the middle- when compared to high-school students. However, HEI vegetable was better in the middle- and high-school students when compared to elementary school students. Child nutrition professionals should organize programs and policies which are age and grade specific. Interventions that can increase fruit and whole fruit consumption in the middle- and high-school students and increase vegetable consumption in elementary school children can have promising results. Also, as the results have shown that the recommendations were consistently not met across all age-grade groups, interventions that can increase produce intake of all school children are required. Child nutrition professionals can prioritize more fruit consumption in higher grade groups, which can help increase HEI fruit, HEI whole fruit, RI fruit in the middle-and high-school students; and more vegetable consumption in elementary school students, which can help increase HEI vegetable in elementary-school students. Also, fruits (79.62%) and vegetable (97.58%) intake were consistently not met across the board, but some groups had a higher percentage of not meeting the recommendations as compared to other, as was the case in meeting fruit recommendations by high-school students (86.13%) was higher than middle- (82.40%) and elementary-school (70.32%) students. Child nutrition professionals can target specific nutrition education initiatives, while partnering with teachers and librarians, and implement interventions in different age-grade groups.

Evidence from previous research suggests that there may be strategies to enhance fruit and vegetable acceptance and consumption include providing early and repeated exposure to a variety of produce and incorporating fruits and vegetables into main dishes and snacks. Initiatives such as celebrating “Fruit and Vegetable Weeks” and offering taste-testing opportunities in multiple forms can further encourage acceptance. Careful menu planning combined with targeted marketing can also increase intake. Integrating nutrition science into classroom examples helps normalize produce consumption (FoodMASTER Initiative, 2025). Additionally, parent–child and child-focused nutrition education programs may be beneficial. Collaboration between school nutrition professionals and teachers to implement reward-based interventions can further promote fruit and vegetable intake among students.

Given the chronic disease rate among the youth related to low produce intake, it should be a priority to enhance fruit and vegetable consumption in children specific to their age-grade groups (World Health Organization, 2023; National Institutes of Health, 2021). Adding/revising Family and Consumer Science (FCS) as well as Healthy Eating Education into school curriculum could help.

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Table 1. *Descriptive Covariate Table: Frequency and Percentage of Total*

	Frequency	Percent (%)
Income-to-Poverty Ratio Classification		
<130%	2,382	46.37
130–185%	661	12.87
>185%	2,094	40.76
Race Classification		
Mexican American	1,199	23.34
Other Hispanic	553	10.77
Non-Hispanic White	1,418	27.60
Non-Hispanic Black	1,310	25.50
Other races- Including Multi-Racial	657	12.79

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Table 2. *Produce Intake Diet Quality (HEI and RI) of School Children According to School Grade Groups*

	Mean (SD)	Minimum	Maximum
	HEI (%)		
HEI Fruit	2.43 (1.74)	0	5
Elementary	2.83 (1.66)		
Middle	2.24 (1.73)		
High	1.96 (1.72)		
HEI Vegetable	1.39 (1.12)	0	5
Elementary	1.37 (1.08)		
Middle	1.38 (1.16)		
High	1.44 (1.15)		
HEI Whole Fruit	1.98 (1.83)	0	5
Elementary	2.36 (1.82)		
Middle	1.86 (1.80)		
High	1.51 (1.74)		
HEI Greens and Beans	1.07 (1.42)	0	5
Elementary	1.09 (1.41)		
Middle	1.10 (1.48)		
High	1.02 (1.39)		
	RI (%)		
RI Fruit (%)	63.35(69.65)	0	1294.72♦
Elementary	79.52 (71.78)		
Middle	54.40 (67.94)		
High	45.59 (61.68)		
RI Vegetable (%)	24.48 (24.59)	0	255.90♦
Elementary	27.35 (27.09)		
Middle	22.93 (23.20)		
High	21.28 (20.85)		

Note. Number of participants=5,137. SD= Standard Deviation. HEI= Healthy Eating Index. Sc.= School. RI fruit and RI vegetable intake were calculated using the formula ([consumed intake/recommended intake]*100).

♦ signifies an outlier, which may occur in NHANES data. Given the formula of (consumed/recommended)×100, the outlier value of 1294.72 signifies that a child/a few children consumed 12.94 times the recommended amount of that food group. Such data appears in NHANES as a child/few children may be consuming a very large portion of a produce item, for example, an unusually large smoothie/juice/composite foods.

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Table 3. *Effect of School-Grade Groups on Produce Intake Diet Quality*

		HEI			RI	
	HEI Fruit	**HEI Vegetable**	**HEI Whole Fruit**	**HEI Greens and Beans**	**RI Fruit**	**RI Vegetable**
	…	…	…	…	…	…
Elementary Sc. (Reference group)						
Middle Sc. (Coeff (S.E.; *p*-value))	-0.42 (0.10; <.001)***	0.15 (0.07; 0.04)*	-0.31 (0.11; 0.004)**	0.18 (0.09; 0.06)	-21.86 (3.56; <.001)***	-3.15 (1.66; 0.06)
High Sc. (Coeff (S.E.; *p*-value))	-0.81 (0.09; <.001)***	0.18 (0.07; 0.01)**	-0.85 (0.10; <.001)***	0.04 (0.08; 0.65)	-32.04 (3.50; <.001)***	-4.85 (1.47; 0.001)**
F	15.7***	2.34*	20.87***	3.14**	18.09***	2.72**
R-squared	0.07	0.01	0.06	0.01	0.06	0.01

Notes: Number of participants=5,137. Coeff=Coefficients; S.E.= Standard error; Coeff and S.E. from weighted OLS regressions. RI= Recommended Intake. F= F-test. Sc.= School. Controls variables included race and ratio of income to poverty categories, and their coefficients were suppressed. *p<.05, ** p<.01, *** p<.001.

Table 4. *Children Participants in School Lunch Program Meeting or Not Meeting Their Fruit and Vegetable Recommendations According to Their School Grade Groups*

School grade group	Fruit recommendations (p<.001)		Vegetable recommendations (p=.68)	
	Met (%)	Not met (%)	Met (%)	Not met (%)
Elementary Sc.	29.68	70.32	2.37	97.63
Middle Sc.	17.60	82.40	2.60	97.40
High Sc.	13.87	86.13	2.28	97.72

Note. RI% fruit and RI% vegetable intake were calculated using the formula ([consumed intake/recommended intake]*100). Recommended intake was calculated for different age-gender groups based on the energy level according to the participant's physical activity level. Recommendations were met if RI was ≥100; otherwise, they were categorized as not met. Sc.= School.

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ABSTRACT

PURPOSE/OBJECTIVES

The objective of this study was to examine differences across children's grade levels/National School Lunch Program meal groups [elementary/K–5 grades, middle/6–8 grades, high-school/9–12 grades] in child produce intake diet density estimated using a Healthy Eating Index (HEI) component score; and child produce intake diet ratio estimated using Recommended Intake (RI) based on Dietary Guidelines for Americans for respective age-gender-activity groups.

METHODS

The 2009–14 National Health and Nutrition Examination Survey (NHANES) data were utilized. A nationally representative sample of children aged 5–18 whose school served lunches was selected. Demographic and interview data from NHANES included sociodemographic characteristics, dietary intake (2-day 24-hour recall), participation in school meals, and physical activity. STATA/IC was utilized to conduct ordinary least squares (OLS) regression.

RESULTS

Participants (n=5,137) were predominantly non-Hispanic White (27.60%), 5–18 years old (mean=11±4 years), male (50.38%), with an average family income-to-poverty ratio of 2± 1.6. HEI fruit and whole fruit as well as RI fruit in middle school [$p<.001$; $p<.01$; $p<.001$] and high school students [$p<.001$; $p<.001$; $p<.001$] was lower when compared to elementary school children; HEI vegetable in middle [$p<.05$] and high school students [$p<.05$] was higher when compared to elementary school students; RI vegetable of high school students [$p<.01$] was lower when compared to elementary school students, holding all other variables constant. When comparing middle- to high-school students, HEI fruit [$p<.01$]; HEI whole fruit [$p<.001$]; and RI fruit [$p<.01$] was lower in high-school students when compared to middle-school students.

APPLICATIONS TO CHILD NUTRITION PROFESSIONALS

These results can inform modifications to programs and policies targeted to different grade groups. Nutrition-education related to fruit and whole fruit for middle and high school students is warranted. Similarly, nutrition education related to vegetable intake is warranted for elementary school students. Highlighting menu options with various food groups in weekly menus is suggested.

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REFERENCES

Bandura, A. (2012). Social cognitive theory. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), Handbook of theories of social psychology (pp. 349–373). Sage Publications. https://doi.org/10.4135/9781446249215.n18

Bergman, E. A., Englund, T., Taylor, K. W., Watkins, T., Schepman, S., & Rushing, K. (2014). *School Lunch Before and After Implementation of the Healthy Hunger-Free Kids Act*. *38*(2), 12.

Caton, S. J., Blundell, P., Ahern, S. M., Nekitsing, C., Olsen, A., Møller, P., Hausner, H., Remy, E., Nicklaus, S., Chabanet, C., Issanchou, S., & Hetherington, M. M. (2014). Learning to Eat Vegetables in Early Life: The Role of Timing, Age and Individual Eating Traits. *PLoS ONE*, *9*(5), e97609. https://doi.org/10.1371/journal.pone.0097609

Centers for Disease Control and Prevention. (2010). *National Health and Nutrition Examination Survey (NHANES) MEC In-Person Dietary Interviewers Procedures Manual*. https://wwwn.cdc.gov/nchs/data/nhanes/2009-2010/manuals/mec_in_person_dietary_procedures_manual_mar_2010.pdf

Centers for Disease Control and Prevention. (2020a, January 29). *Measuring Physical Activity Intensity*. https://www.cdc.gov/physicalactivity/basics/measuring/index.html

Centers for Disease Control and Prevention. (2020b, February 21). *NHANES Response Rates and Population Totals*. https://wwwn.cdc.gov/nchs/nhanes/ResponseRates.aspx

Centers for Disease Control and Prevention. (2020c, March 1). *Physical Activity Recommendations By Age Group*. Centers for Disease Control and Prevention. https://www.cdc.gov/physicalactivity/basics/age-chart.html

Centers for Disease Control and Prevention. (2025). *National Health and Nutrition Examination Survey*. https://www.cdc.gov/nchs/nhanes/index.htm

Centers for Disease Control and Prevention. (2025). *National Health and Nutrition Examination Survey*. https://www.cdc.gov/nchs/nhanes/index.htm

FoodMASTER Initiative. (2025). FoodMASTER: Using food to teach applied mathematics and science. Retrieved December 1, 2025, from https://foodmaster.org/

Guenther, P. M., Casavale, K. O., Reedy, J., Kirkpatrick, S. I., Hiza, H. A. B., Kuczynski, K. J., Kahle, L. L., & Krebs-Smith, S. M. (2013). Update of the Healthy Eating Index: HEI- 2010. *Journal of the Academy of Nutrition and Dietetics*, *113*(4), 569–580. https://doi.org/10.1016/j.jand.2012.12.016

Hager, E. R., & Turner, L. (2016). Successes of the Healthy Hunger-Free Kids Act. *JAMA Pediatrics*, *170*(1), e154268–e154268. https://doi.org/10.1001/jamapediatrics.2015.4268

Hayes, D., Contento, I. R., & Weekly, C. (2018). Position of the Academy of Nutrition and Dietetics, Society for Nutrition Education and Behavior, and School Nutrition Association: Comprehensive Nutrition Programs and Services in Schools. *Journal of the Academy of Nutrition and Dietetics*, *118*(5), 913–919. https://doi.org/10.1016/j.jand.2018.03.005

Institute of Medicine. (2010). *School Meals: Building Blocks for Healthy Children*. Washington, DC: The National Academies Press. https://doi.org/10.17226/12751

Jones, J. W., Todd, J. E., & Toossi, S. (2025). *The Food and Nutrition Assistance Landscape: Fiscal Year 2024 Annual Report* (EIB-291). U.S. Department of Agriculture, Economic Research Service.

Kirkpatrick, S. I., Reedy, J., Krebs-Smith, S. M., Pannucci, T. E., Subar, A. F., Wilson, M. M., Lerman, J. L., & Tooze, J. A. (2018). Applications of the Healthy Eating Index for Surveillance, Epidemiology, and Intervention Research: Considerations and Caveats. *Journal of the Academy of Nutrition and Dietetics*, *118*(9), 1603–1621. https://doi.org/10.1016/j.jand.2018.05.020

Lorson, B. A., Melgar-Quinonez, H. R., & Taylor, C. A. (2009). Correlates of Fruit and Vegetable Intakes in US Children. *Journal of the American Dietetic Association*, *109*(3), 474–478. https://doi.org/10.1016/j.jada.2008.11.022

National Cancer Institute. (2019, September). *Developing the Healthy Eating Index*. https://epi.grants.cancer.gov/hei/developing.html

National Institutes of Health. (2021). *Fruit and vegetable consumption reduce risk of death.* NIH Research Matters. https://www.nih.gov/news-events/nih-research-matters/fruit-vegetable-consumption-reduce-risk-death

Pérez, A., Hoelscher, D. M., Brown, H. S., & Kelder, S. H. (2007). Differences in Food Consumption and Meal Patterns in Texas School Children by Grade. *Preventing Chronic Disease*, *4*(2). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1893122/

SCHOOL NUTRITION ASSOCIATION

Reedy, J., Lerman, J. L., Krebs-Smith, S. M., Kirkpatrick, S. I., Pannucci, T. E., Wilson, M. M., Subar, A. F., Kahle, L. L., & Tooze, J. A. (2018). Evaluation of the Healthy Eating Index-2015. *Journal of the Academy of Nutrition and Dietetics*, *118*(9), 1622–1633. https://doi.org/10.1016/j.jand.2018.05.019

Sisson, S. B., Church, T. S., Martin, C. K., Tudor-Locke, C., Smith, S. R., Bouchard, C., Earnest, C. P., Rankinen, T., Newton, R. L., & Katzmarzyk, P. T. (2009). Profiles of Sedentary Behavior in Children and Adolescents: The U.S. National Health and Nutrition Examination Survey, 2001–2006. *International Journal of Pediatric Obesity : IJPO : An Official Journal of the International Association for the Study of Obesity*, *4*(4), 353–359. https://doi.org/10.3109/17477160902934777

StataCorp. (2025). *Stata Statistical Software: Release 19*. College Station, TX: StataCorp LLC

U.S. Department of Agriculture, & U.S. Department of Health and Human Services. (2020). *Dietary Guidelines for Americans, 2020–2025* (9th ed.). https://www.dietaryguidelines.gov/

U.S. Department of Agriculture, Agricultural Research Service. (2019, October 17). *Food and Nutrition Database for Dietary Studies*. https://www.ars.usda.gov/northeast- area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/food-surveys-research-group/docs/fndds/

U.S. Department of Agriculture, Economic Research Service. (2024). *Dietary Quality by Food Source and Demographics in the United States, 1977–2018*. https://www.ers.usda.gov/data-products/food-consumption-nutrient-intakes-and-diet-quality

U.S. Department of Agriculture, Food and Nutrition Service. (2016, July 29). *Final Rule: National School Lunch Program and School Breakfast Program: Nutrition Standards for All Foods Sold in School as Required by the HHFKA of 2010*. https://www.fns.usda.gov/cn/fr-072916d

U.S. Department of Agriculture, Food and Nutrition Services. (2013, November). *Healthy Hunger-Free Kids Act*. https://www.fns.usda.gov/school-meals/healthy-hunger-free-kids- act

U.S. Department of Agriculture, Food and Nutrition Services. (2020d, January 4). *Child Nutrition Tables*. https://www.fns.usda.gov/pd/child-nutrition-tables.

U.S. Department of Agriculture. (2019a, March). *Healthy Eating Index (HEI) Reports*. https://www.fns.usda.gov/cnpp/healthy-eating-index-hei-reports

U.S. Department of Health and Human Services, & U.S. Department of Agriculture. (2015). *2015-2020 Dietary Guidelines for Americans 8th Edition*.

U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion (2023) Average Healthy Eating Index-2015 Scores for the Children and Adolescents by Age Groups, WWEIA, NHANES 2017-2018.

World Health Organization. (2023). *Increasing fruit and vegetable consumption to reduce the risk of noncommunicable diseases.* https://www.who.int/tools/elena/interventions/fruit-vegetables-ncds

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Produce Safety University Impacts Child Nutrition Specialist Work

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KEYWORDS: produce, food safety, training, knowledge, confidence

INTRODUCTION:

The National School Lunch Program (NSLP) and the National School Breakfast Program (SBP) are programs administered by the United States Department of Agriculture's (USDA) Food and Nutrition Service (FNS). Over 95,000 schools/institutions serve lunches to more than 29.7 million students each day (School Nutrition Association [SNA], 2025), with approximately 50% of students qualifying for free or reduced-price meals to address food insecurity (National Center for Education Statistics, 2023). Reimbursable meals must meet specific nutritional standards outlined in the Healthy, Hunger-Free Kids Act (USDA, 2024). The NSLP requires ½ cup of fruits and ¾ cup of vegetables (USDA FNS, 2024b), while the SBP requires inclusion of one cup of fruit (USDA FNS, 2024c). The Fresh Fruit and Vegetable Program provides free, fresh fruit and vegetable snacks to children at eligible elementary schools (USDA FNS, 2022). Produce provided in school meals must be grown in the United States (U.S.) as part of the Buy American Provision, with exceptions allowed due to shortages or excessive cost (USDA FNS, 2024a). Schools incorporate local produce to support local economies, offer fresher and more seasonal foods, enhance Farm to School efforts, and create educational opportunities. Research showing that these programs increase students' willingness to try produce and reduce plate waste further drives interest in using local foods (Elnakib et al, 2024; Walshe et al., 2024). Findings from the Farm to School Census indicated that 74.1% of school food authorities reported participating in farm-to-school activities during the 2022–2023 school year (USDA, 2024).

The safety of uncooked fresh produce in the U.S. has been a concern, as there is no kill step to eliminate pathogenic microorganisms. Fresh produce was identified in most of the foodborne illness outbreaks (n=85) tracked to schools, colleges, and universities, and has been implicated in multistate outbreaks (Centers for Disease Control and Prevention [CDC], 2025; Carstens et al., 2019). The Food Safety Modernization Act (FSMA) Produce Safety Rule (PSR), established in 2016 (Food and Drug Administration [FDA], 2024), requires science-based minimum standards for the safe production, harvesting, packing, and holding of fruits and vegetables grown for human consumption. In addition to compliance with USDA nutritional standards for breakfast and lunch, retail food establishments, such as school meal programs, must follow state or local health regulations based on the FDA's Model Food Code (FDA, 2022). The Person in Charge (PIC) is to be knowledgeable about food safety risks, and food used in operations is to be sourced from approved suppliers. However, fresh, unprocessed produce can be purchased from any source (FDA, 2022). Therefore, it is incumbent upon the purchasing agent to ensure the product's safety.

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To aid school foodservice staff in managing food safety risks associated with fresh produce, a one-week training course was developed jointly by USDA's FNS and Agricultural Marketing Service (AMS) in 2010, called Produce Safety University (PSU) (USDA FNS, 2025). PSU is an in-depth course envisioned to be modeled on a train-the-trainer approach with supporting resources available to participants, addressing safe handling of produce purchased from traditional suppliers, direct from farmers, and through the Department of Defense (DoD) Fresh program. Train-the-trainer courses are designed to increase knowledge, influence attitude and behavioral changes, and support the spread of information (Pearce et al., 2012; Rubak et. al., 2008; Orfaly et al., 2005). The PSU curriculum is based on the Theory of Planned Behavior (TPB) and the related concept of perceived behavioral control (PBC), which is a person's belief in their ability to perform a behavior shaped by self-efficacy and the presence or absence of barriers (Ajzen, 1988). The PSU curriculum includes information on how produce is grown, harvested, and processed, along with guidance on how buyers can ensure that safe, high-quality products are purchased and used in school meals. The curriculum includes experiential learning components with a field trip to growers, packers, and processors, and a hands-on "Produce Labs" to demonstrate concepts related to quality and safety. Produce is a complex food category, as each type of fruit and vegetable has production, harvesting, processing, and storage methods specific to each item and growing location.

Since its inception through 2022, over 1,800 nutrition staff and others affiliated with school meals have graduated from virtual and in-person PSU programs (USDA FNS, 2025).

In 2023, Texas Tech University (TTU) faculty with expertise in food safety (produce production, processing, and foodservice), agriculture education, and adult learning began a Cooperative Agreement with USDA to conduct a mixed-methods, evidence-based evaluation of PSU. One major question in the evaluation was to identify the reported knowledge, confidence, and the impact of the PSU program on behavioral and practical change, which is the focus of this article. Data were gathered from program participants since 2018, recognizing that job changes and retirements were likely with graduates from earlier years. That recall of requested information would be greater with recent graduates.

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METHODOLOGY:

Human Safety Approval

The Texas Tech University Institutional Review Board (Protocol No: IRB2023-817) granted exempt approval to conduct the study. As part of the exemption status of this research project, personal identifying information, such as participant name, street address, phone number, or email address, was not collected for analysis. As part of the human subject approval, participants can answer as few or as many questions as they like in the survey. The number of respondents is included in the tables for each result.

Population Surveyed

The population of PSU graduates evaluated in this research was from the classes of 2018, 2019, 2021, 2022, 2023, and 2024 (N=766). A survey was emailed and mailed to the first set of PSU graduates from 2018, 2019, 2021, 2022, and 2023 (N=632) and only emailed to the cohort from 2024 (N=134) following the 2024 PSU workshops due to the cost of mailing and low return rate of mailed surveys from the initial deployment. All emails and/or mailing addresses were provided by the USDA PSU administrator.

Data Collection Instrument

Email and mailed surveys contained the same demographic and impact questions (55 questions). Participants were asked to provide information about their education, work experience, and school district characteristics. To assess the impact of PSU, questions about the training related to fresh produce safety, knowledge changes, confidence levels, and training and production behaviors were included. Survey instruments were designed to be completed in approximately 30 minutes and included a variety of response options (multiple choice, select from, open-ended, and Likert-type rating scales). Rating scales had three, four, or five points with a Not Applicable option included.

Piloting of Survey

Pilot testing of the survey instrument was conducted with a sample of PSU graduates from the 2017 cohort (n = 31). An initial email notification of the survey was sent to provide the purpose of the survey. Two days later, a second email was sent with an embedded survey link and QR code included. After seven days, and then again fourteen days after the second email, reminder emails were sent to complete the survey. A final email was sent on day 21 to indicate a notice of the pilot survey closing. While the pilot data was being collected, two subject matter experts assisted in the evaluation of the survey. Pilot data were reviewed for construct, content, face, and criterion validity using the methodology outlined in Fink (2010). In brief, we evaluated construct validity through expert review to verify that each item accurately represented its intended theoretical construct. Content validity was assessed by having experts judge items for relevance, clarity, representativeness, and essentiality. Face validity was examined through expert review and pilot testing to determine whether items appeared appropriate and understandable and whether any key content was missing. Criterion validity was assessed by comparing pilot results with established measures and prior research findings. As a result of the pilot study results, several questions were rephrased due to questions failing the construct validity testing.

Data Collection

Survey instruments were sent to PSU graduates from 2018 to 2023 (excluding the year 2020, as no classes were held) in the spring of 2024, and to 2024 PSU graduates in the fall of 2024, approximately six months following completion of the PSU classes that year. The same protocol used for pilot testing was followed for survey dissemination.

Data Analysis

The data presented is a subset of a greater dataset that explored Adult Learning Theory and the differences in modality of the PSU course. Data were imported from the Qualtrics survey system into the Statistical Package for the Social Sciences (SPSS) (version 31) and Python in Google Colab (version 3.11). Due to the exemption for human subjects, PSU graduates could provide information as they desired, which is why the number of respondents to survey items varied (U.S. National Science Foundation, 2025). Missing responses to survey questions were omitted from calculations.

The scale of measurement for each variable (nominal, ordinal, interval, and ratio) was identified to ensure appropriate statistical analysis. Descriptive statistics, including frequencies, means, and percentages, were calculated using SPSS. Python in Google Colab was used for Likert-scale questions and "check all that apply" questions. Survey responses were scored numerically: 1 = Increased ("increased somewhat" and "increased significantly"), 2 = "no change", 3 = Decreased "decreased somewhat" and "decreased significantly"), 4 = "not applicable". One (increase) is reported in frequency. For questions with a 'check all that apply' format, each option selected by a respondent was treated as a yes response, and frequencies and percentages were calculated by splitting the responses, cleaning the text, and counting the number of respondents selecting each option.

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RESULTS AND DISCUSSION:

Of the 766 graduates who attended PSU between 2018 and 2024, 67 total contacts were unreachable, as 45 of the email addresses were invalid, and 22 mailed surveys were returned to sender. Data from the mailed survey instruments were added manually to the data set for statistical analysis. A total of 148 of the 699 graduates who received the survey filled in at least part of the questionnaire for a response rate of 21.2%. This response rate is consistent with past research, as noted by Sauer et al. (2021). The average email-based response rate for school nutrition specialists ranged from 10 to 40% (Sauer et al., 2021), and according to the research of Wu et al. (2022), who concluded in a meta-analysis of online surveys in the education field, an average response rate of 44.1%. Other researchers have noted that response rates with school districts are as low as 16% (Boutros et al., 2019; Grisamore & Roberts, 2014; Roberts et al, 2018).

Demographic profiles of PSU graduates who responded to the surveys are shown in Table 1. Of the 90 respondents reporting work experience, 34 (37.8%) had more than 15 years of experience in child nutrition programs, while 45 (50%) indicated they had 5–14 years of experience in school foodservice. Child nutrition programs now include six generations in their workforce, marking a significant demographic shift. This mirrors broader national trends noted by Pearce (2024), who reported that six generations are currently represented in the U.S. workforce. Compared to the four generations identified by Strohbehn et al. (2014), this expansion highlights the need for updated management and training approaches to support a more diverse staff.

Fifteen of the 88 respondents who provided enrollment information were from schools with over 19,000 students, while 35 worked in districts with 2,500 to 19,000 students. There has been a long-term trend in the U.S. toward consolidating smaller, rural school districts into larger, "mega" school districts, driven by arguments of cost-efficiency, as Schmidt and Schlottmann (2024) noted that the number of school districts had fallen from over 200,000 in 1910 to under 14,000 by the early 2020s. This movement toward larger school districts has continued; thus, school nutrition program administrators' knowledge and skills as they make food quality and safety decisions related to procurement, preparation, and service impact more students. Of these 88 respondents, 11 had not worked directly in child nutrition programs, noting employment areas such as Farm to School or a State Agency, suggesting potential influence over multiple school districts.

Of the 84 respondents who identified their educational level, 56 (66.6%) had earned bachelor's degrees, with 22 of these respondents having completed a master's degree. Other respondents to this question indicated some college credit had been earned (n=14) or trade/vocational training completed (n=4). Professional standards identified by the USDA for School Food Authorities include requirements that school meal program directors have an earned college degree or 10 or more years of experience in school nutrition for districts with enrollments of over 10,000 students (USDA FNS, 2021). In addition, recent versions of the FDA's Model Food Code require the PIC to have completed food safety training (FDA, 2022). Respondents indicated the food safety training they received, selecting multiple options. Of the 88 who responded, 70 (79.5%) had completed the ServSafe® Course, and/or over 50 had also completed a college course in food safety or food science (61.4%) or a course from the Institute of Child Nutrition (ICN) (56.8%). ServSafe® is the National Restaurant

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Association's widely used program offering training and certification in food safety for foodservice managers and staff that is approved by the Conference on Food Protection as meeting the Food Code's food safety knowledge requirement for the PIC (ServSafe®, 2025; The Conference for Food Protection, 2025).

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Table 1. *A Profile of PSU Graduate Survey Respondents who attended in 2018, 2019, 2021, 2022, 2023, or 2024*

Characteristics	Total Responses (N)	Frequency (n)	Frequency percent (%)
Total number of years respondents reported employment within a child nutrition program.	90		
More than 15 years		34	37.8
11–15 years		22	24.4
6–10 years		23	25.6
0–5 years		11	12.2
School district size	88		
Medium (2,500–19,999 students)		35	39.8
Small (less than 2,500 students)		27	30.7
Not employed in a school district at the time of attendance.		11	12.5
Large (19,000–39,999 students)		10	8.8
Mega (400,000 or more)		5	5.7
Highest Level of Educational Preparation	84		
Bachelor's degree		34	40.4
Master's degree		22	26.2
Some college credit earned		14	16.7
Associate degree		9	10.7
Trade/technical/or vocational training		4	4.8
I don't wish to answer.		1	1.2
Food safety training received[a]	88		
College course credit in food safety, food science, food production, or other		54	61.4
ServSafe® Course from the National Restaurant Association		70	79.5
Food safety presentations at conferences or training (1 to 4 hours in length)		63	71.6
Completion of the Institute of Child Nutrition Course		50	56.8
Serving Up Science (from the Center for Food Safety in Child Nutrition Programs at Kansas State University)		16	18.2
HACCP workshops		11	12.5
ProSafe® from the National Restaurant Association		5	5.7
National Environmental Health Association Foodservice Certification		2	2.3
Other (please identify)		2	2.3

[a] Reflects the number of respondents who selected the answer. Respondents could select all that applied. Due to human subject approval, the participants could answer as much or little of the survey as they wish.

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Impact

The impact of PSU included the training graduates had provided to others and reported changes in knowledge, confidence, and behaviors. Table Two shows these reported impacts.

Table 2. *Impact of Produce Safety University to Child Nutrition Specialists Who Graduated From the Course in 2018, 2019, 2021, 2022, 2023 or 2024.*

Impact	Total Responses (N)	Frequency (n)	Frequency percent (%)
Training others in Produce Safety			
PSU graduates indicated that they had provided training on at least one of the PSU topics[a]	99	83	83.3
Those who provided training indicated reasons that they did so because there was a perceived need within the school district for nutrition program staff to have this information[b]	99	64	64.6
Effectiveness of training materials when PSU graduates trained others[a]	99	54	54.5
Those who provided training indicated reasons that they did so because there was a need for other school staff to understand produce safety[b]	99	28	28.3
Lack of time was seen as a barrier for training others[b]	99	10	10.1
Knowledge Gained			
Gained knowledge of identifying food safety risks with fresh produce along the supply chain [c]	100	93	92.9
Gained higher knowledge about correct produce safety practices [c]	72	63	87.5
Gained knowledge to correct improper produce safety practices [c]	73	63	86.3

[a] Yes or no question. Only Yes responses are reported.

[b] Check all that apply was the response option. Percentages are based on the number responding to each question.

[c] 1 = Responses are for those who reported changes had increased, increased somewhat, or increased significantly. Only increases are reported.

(Table 2 continues)

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Table 2 (continued). *Impact of Produce Safety University to Child Nutrition Specialists Who Graduated From the Course in 2018, 2019, 2021, 2022, 2023 or 2024.*

Impact	Total Responses (N)	Frequency (n)	Frequency percent (%)
Confidence Gained			
Gained confidence to correct unsafe behaviors with fresh produce [c]	75	73	97.3
Gained confidence in correcting improper produce safety practices [c]	74	67	91.0
Gained confidence in writing produce specifications [c]	54	42	77.5
Higher comfort level with rejecting fresh produce items at delivery that didn't meet their specifications [c]	72	55	76.4
Higher comfort level with writing produce specifications [c]	64	43	68.8
Gained confidence in correcting the safety of produce from the school garden [c]	76	30	39.5
Behavioral/ Practices Changed			
Graduates indicated they were able to identify potential produce safety issues [c]	69	64	93.0
Reported they had improved food handling and service practices [c]	102	84	82.3
Reported they had made changes in communicating with produce suppliers about the quality and condition of produce [b]	60	49	81.7
Reported they had made changes in communicating with produce suppliers about delivery conditions [b]	60	45	75.0
Reported they had made changes in communicating with produce suppliers about temperature controls [b]	60	44	73.3
Graduates indicated they were able to make changes to improve receiving, storage, preparation, or service practices [c]	99	68	68.7

[a] Yes or no question. Only Yes responses are reported.

[b] Check all that apply was the response option. Percentages are based on the number responding to each question.

[c] 1 = Responses are for those who reported changes had increased, increased somewhat, or increased significantly. Only increases are reported.

(Table 2 continues)

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Table 2 (continued). *Impact of Produce Safety University to Child Nutrition Specialists Who Graduated From the Course in 2018, 2019, 2021, 2022, 2023 or 2024.*

Impact	Total Responses (N)	Frequency (n)	Frequency percent (%)
Behavioral/ Practices Changed			
Reported they had made changes in communicating with produce suppliers about packaging information [b]	60	36	60.0
Reported they had made changes in communicating with produce suppliers about produce safety in general [b]	60	44	58.8
Reported less produce waste in the kitchen because of PSU [c]	99	55	55.6
Reported they had made changes in how they sourced fresh produce [b]	99	55	55.5
Reported they had made changes in communicating with produce suppliers about worker/student health and hygiene practices [b]	60	33	55.0
Reported that they had created or improved written produce specifications [b]	100	53	53.5
Reported they had made changes in communicating with produce suppliers about traceability documentation [b]	60	30	50.0
Reported an increase in the number of local producers providing fruits and vegetables [c] to their programs that are GAP certified	19	9	47.4
Reported an increase in the volume of local growers used [c]	53	24	45.2
Reported they had made changes in communicating with produce suppliers about on-farm food safety documentations [b]	60	25	41.7
Reported developing new procedures in preparation of fresh produce [b]	60	22	36.7
Graduates indicated they were able to create new farm to school activities [b]	73	24	32.9

[a] Yes or no question. Only Yes responses are reported.

[b] Check all that apply was the response option. Percentages are based on the number responding to each question.

[c] 1 = Responses are for those who reported changes had increased, increased somewhat, or increased significantly. Only increases are reported.

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(Table 2 continues)

Table 2 (continued). *Impact of Produce Safety University to Child Nutrition Specialists Who Graduated From the Course in 2018, 2019, 2021, 2022, 2023 or 2024.*

Impact	Total Responses (N)	Frequency (n)	Frequency percent (%)
Behavioral/ Practices Changed			
Reported they had made changes in communicating with produce suppliers about GAPs [b]	60	17	28.3
Reported staff monitoring fresh produce inventory [b]	60	17	28.3
Collaborated with other PSU graduates after attending [a]	86	24	27.9
Reported they had an increase in volume of purchases or use of product from distributors, or school gardens [c]	55	12	21.8
Reported staff washing unprocessed fresh produce [b]	60	12	20.0
Reported staff monitoring self-service fruit and vegetable bars [b]	60	9	15.0
Reported staff developing storage protocols [b]	60	8	13.3

[a] Yes or no question. Only Yes responses are reported.

[b] Check all that apply was the response option. Percentages are based on the number responding to each question.

[c] 1 = Responses are for those who reported changes had increased, increased somewhat, or increased significantly. Only increases are reported.

Training Others. One of PSU's intentions was to be a train-the-trainer course. Of the 99 graduates who responded to the question about providing training on one or more topics about produce safety since completing the course, 83 (83.3%) indicated they had done so, reporting this was done because of a perceived need within their district for school nutrition staff to have this information (n=64) or for other school staff to understand produce safety (n=28). An average of 5.4 classes were taught with around 30 attendees at each. Those who had trained noted the PSU Binder and other materials provided during the course were helpful (n=54). Lack of time was most frequently cited as a barrier to training others (n=10); most respondents indicated they felt prepared to train others (n=101).

Knowledge. Over 90% of respondents said they had gained knowledge about identifying food safety risks from fresh produce (n=93; 92.9%). Of these, 63 noted a gain in knowledge to correct unsafe produce practices. Research has shown that in-depth knowledge about the produce industry can help shape graduates' attitudes and beliefs about food safety along the supply chain, which supports their self-regulation and affects

behavioral change (Roberts et al., 2020; Ryan, 2009; Lorig, 2003). Although knowledge by itself is not sufficient, it is a crucial first step that supports self-regulation, builds understanding of important health and social issues, and increases the likelihood of taking action (Arlinghaus & Johnston, 2017).

Confidence Gained. Of the 75 participants who answered questions about changes in produce safety practices, 73 reported their confidence in correcting unsafe behaviors with fresh produce had increased either "significantly" or "somewhat". Similarly, 67 noted "significant" or "somewhat of an increase" in confidence when correcting improper produce safety practices, and 30 reported similar increases in confidence in correcting the safety of produce from school gardens. A 2018 joint position statement from the Academy of Nutrition and Dietetics, the Society for Nutrition Education and Behavior, and the School Nutrition Association promoted school gardens as part of a multidisciplinary strategy to improve children's nutrition (The Academy of Nutrition and Dietetics, the Society for Nutrition Education and Behavior, and the School Nutrition Association, 2018). Ensuring confidence in safe gardening practices is therefore essential as school gardens are used by many teachers as a form of experiential learning, and it is not uncommon for produce from these gardens to be used in school meals or for students to influence garden practices at home. Respondents also noted higher confidence (n=42) and greater comfort level (n=43) with writing produce specifications. Written specifications are a tool used by the buyer to communicate with a product supplier about their purchasing needs. Fresh produce suppliers may include a wholesale operation or a local grower, including school gardens. Of the 75 respondents, 55 indicated they now had a higher comfort level with rejecting delivered fresh produce items that did not meet their specifications.

Behavior Changes. The Theory of Planned Behavior proposes that behavior is driven by intention, which is influenced by attitudes, subjective norms, and perceived behavioral control (PBC). Together, these factors shape intention, the strongest predictor of actual behavior. Roberts et al. (2020) applied TPB to food safety in school nutrition programs, finding that knowledge alone was insufficient; attitudes, norms, and PBC also played key roles in shaping employee behaviors. Our findings showed graduates reported making changes to improve the receiving, storage, preparation, or service of fresh produce to strengthen food safety controls (n = 68), with 84 specifically noting improvements in handling and service practices. Because of PSU, 55 participants reported less waste of produce in the kitchen. Unnecessary product waste can lead to menu shortages and increased costs. School nutrition programs strive to serve quality foods in an economical manner. Waste from produce can be caused by damage (e.g., bruising) or a lack of training in the correct fabrication of the item, such as excessive trimming of peels. Other notable reported changes included communications with produce suppliers about produce safety in general (n=60), quality and condition of produce (n=49), temperature controls (n=44), packaging information (n=36), worker/student health and hygiene (n=33), traceability documentation (n=30), on-farm food safety documentation (n=25), and Good Agricultural Practices or GAPs (n=17). With increasing interest in Farm to School activities, buyers of fresh produce for school meals must ensure these items are safe for consumption. Behavior changes noted in communicating with produce suppliers, as well as changes reported as made in the foodservice operation, highlight efforts to mitigate these potential risk factors.

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CONCLUSIONS AND APPLICATION:

Survey feedback from PSU Graduates since 2018 shows the knowledge, confidence, and behavioral/ practice change impact of the course is positive (n=148). Results highlight a variation in characteristics of child nutrition program staff with multiple generations responding to the survey; educational backgrounds ranging from high school diploma to a doctoral degree; experience working in school meals from less than a year to more than 15 years; and district enrollments of fewer than 2,500 students to more than 400,000. PSU provides a professional development opportunity that reaches participants with wide variations in age, educational, and environmental traits. This information can be used by school districts when considering training practices for their employees (Strohbehn et al.,2014).

The curriculum was envisioned as a train-the-trainer model to empower child nutrition professionals at all levels to disseminate ways to keep produce safe in school nutrition programs and ensure students are served nutritious food. Train-the-trainer models have been shown across disciplines to be cost-effective and efficient at disseminating information to cause significant changes (Pearce et al., 2012; Suhrheinrich, J., 2011). Graduates responding to our surveys felt prepared to provide training, and most did so, due to a perceived need for school nutrition professionals to have this knowledge, as well as others in the district, such as teachers using a school garden as part of classroom instruction. Resources (such as PowerPoint handouts and activity guides) provided to PSU participants through an online portal were reported as frequently used in the training they provided. With an average of 5.4 classes taught by graduates, the impact of PSU is expanded to reach broader audiences. Those who did not provide any training cited a lack of time as the primary barrier. These results are significant as 14.5% of the respondents are from larger school districts that have more staff to train; thus, additional impacts of the program, including improved safety and quality of produce in school meals, could be seen with increased time to provide training.

Our data was collected following the passage of the FSMA Produce Safety Rule that established requirements for fruit and vegetable growers, although small-scale local farms, which are typical suppliers as part of Farm to School activities, are exempt (FDA, 2024). Respondents reported they had gained *knowledge* about food safety along the fresh produce supply chain, *confidence* in improving practices such as writing specifications, and had made changes in *practices* when communicating with suppliers about on-farm food safety, worker health and hygiene, and traceability documentation. These reported changes in practice when communicating with suppliers, coupled with training provided to district employees not working in school nutrition, provide assurances that Farm to School activities involving fresh produce can be safely implemented. As interest in local food systems continues to grow, school nutrition program administrators are often asked to participate in some type of Farm to School activity, such as using school garden produce in school meals (Bobronnikov et al, 2021). Ensuring safe practices are followed in the garden (during production, harvest, and post-harvest handling) before items are delivered to kitchens is the responsibility of the PIC of the nutrition program, who will establish policies and procedures to guide safe practices. Graduates of PSU are equipped to identify and implement standard operating procedures to protect the nutritional integrity and safety of items served in school meals, as they have the knowledge and confidence about risk mitigation strategies to ensure the safety

of produce from farm to fork. Findings are consistent with past research highlighting that knowledge, attitudes, and behavior are essential recipe ingredients to improve food handling behaviors, as knowledge alone, while the essential first step, is not sufficient, and that Farm to School Coordinators relied on school nutrition staff to communicate safe handling information (Paez et al., 2024; Roberts et al., 2020).

The PSU curriculum was designed to provide knowledge about the produce industry from production to service, thereby influencing their attitudes and beliefs about food safety along the supply chain, which in turn affects behavioral change (Roberts et al., 2018). This knowledge base serves as the foundation for improving the safety of fresh produce served in schools. The content of PSU is more extensive than that presented in typical food safety trainings, such as ServSafe®, the widely used program administered by the National Restaurant Association and one frequently cited by participants as having completed (ServSafe, 2025). The PSU course involves lectures and experiential learning in the form of videos, field trips (for in-person sessions), and hands-on lab sessions (Produce Labs). Thus, multiple learning styles are addressed in the course and serve to influence participants' attitudes about the importance of safe produce. This study found that participants reported behavior changes to improve the safety of fruits and vegetables served in their operations due to the knowledge and confidence gained in PSU. Trainers have strong subject matter expertise on links of the supply chain from production to service and excellent communication skills, with many being knowledgeable about school nutrition programs. Scripted presentations and videos are available on the PSU online portal, which is open to PSU graduates for six months after training, or on the ICN website. Hard copies of most materials, including the PSU Binder, are given to participants at in-person sessions. These attributes of PSU include many of the elements used in evidence-based train-the-trainer models, such as those developed by CDC or the ICN: adult learning principles, expert trainers, emphasis on practical applications, a feedback system for skill development, comprehensive training materials, and ongoing support. A trainer manual (called Protype) was recently developed by the PSU training team and is provided to participants as a tool for training. Protype incorporates many of the elements noted as best practice with train-the-trainer models. These educational tools can be a great asset to any school and/or school district as they plan their professional development activities. Future research could assess the effectiveness of the trainer manual tool to promote knowledge and behavioral change, along with actual knowledge gains of participants, through analysis of pre- and post-PSU assessments using the course materials.

Completion of PSU has shown to be an impactful program for child nutrition professionals and has resulted in positive self-reported knowledge, confidence, and behavior changes that have impacted the safety of produce within attendees' school districts and beyond through additional training with other interested audiences. School nutrition staff are usually the district employees with the greatest knowledge about food safety and risk mitigation from unintentional and intentional contamination of food. Data from The Food Research and Action Center (Hayes & FitzSimons, 2025) shows increases in school breakfast (8 percent) and lunch (6.8 percent) from the 2022–2023 to 2023–2024 school year. As school nutrition programs expand, school meal program staff have an increasingly important role in addressing food insecurity and ensuring food is properly handled from farm to fork.

Results suggest PSU administrators continue virtual and in-person course options to support a diverse workforce, offer mentorship or mock training opportunities as part of continued education, and increase the amount of curriculum available for training others. It is also recommended that PSU consider including the expectation for participants that a minimum number of training sessions on one or more PSU topics be provided.

Limitations to the Study

The authors acknowledge that there are benefits and limitations of utilizing self-reported survey data results. Self-reported data may be less accurate due to the inaccuracies of recall bias, participants not fully understanding questions, and deliberate or unintentional under-reporting or exaggeration (Świątkowski et al., 2025). To improve content validity, researchers utilized a pilot study of the 2017 PSU graduates to validate and improve the survey tool to minimize these conflicts.

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ABSTRACT

PURPOSE/OBJECTIVES

The purpose of this study was to assess the impact of a program called "Produce Safety University" (PSU) on participants' reported knowledge, confidence, and behavior change about fresh produce used in their school meals program.

METHODS

Data were collected from graduates of PSU from classes held from 2018 to 2023 (except for 2020 due to COVID cancellation) via online and mailed surveys, while an online-only survey was sent to graduates of 2024 (due to the low return rate of mailed surveys in previous years). The survey was designed to be completed in ~30 minutes. Demographic information (i.e., educational level, food safety training, employment length, and school district size) about participants and their workplace was collected. Participants were asked about the training they provided to other school nutrition staff on produce safety, their perceptions of the knowledge and confidence gained, and any changes reported in their practices as a result of attending PSU. Descriptive statistics were determined (frequencies, means, and percentages).

RESULTS

Participants represented a wide range of educational backgrounds, experience working in school meals, and the size of the school district. Most (83.3%) had provided training about produce safety for school nutrition staff or others within the district because of a perceived need (64.6%). The majority indicated they had gained knowledge (92.9%) and confidence (97.3%) about produce safety from production to service and reported they had implemented changes in food safety practices related to purchasing, preparation, and service as a result of attending PSU (58.8-82.3%).

APPLICATIONS TO CHILD NUTRITION PROFESSIONALS

Produce Safety University is an immersive, fresh-produce safety course designed to help districts meet fruit-and-vegetable meal requirements and support Farm to School efforts by building participants' ability to identify food-safety risks along the produce supply chain, apply correct produce-safety practices, and recognize and correct improper practices to keep food safe from farm to fork.

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Published by the School Nutrition Association

REFERENCES

Academy of Nutrition and Dietetics, Society for Nutrition Education and Behavior, & School Nutrition Association. (2018). Position of the Academy of Nutrition and Dietetics, Society for Nutrition Education and Behavior, and School Nutrition Association: Comprehensive nutrition programs and services in schools. *Journal of Child Nutrition & Management*, *42*(1). https://schoolnutrition.org/journal/spring-2018-position-of-the-academy-of-nutrition-and-dietetics-society-for-nutrition-education-and-behavior-and-school-nutrition-association-comprehensive-nutrition-programs-and-services-in-school/

Ajzen, I. (1988). *Attitudes, personality, and behavior*. Dorsey Press. https://psycnet.apa.org/record/1989-97547-000

Arlinghaus, K. R., & Johnston, C. A. (2017). Advocating for behavior change with education. *American Journal of Lifestyle Medicine*, *12*(2), 113–116. https://doi.org/10.1177/1559827617745479

Bobronnikov, E., Boyle, M., Grosz, M., Lipton, I., Nutter, R., Velez, M., & Yadav, L. (2021). *Farm to school literature review*. Abt Associates. https://fns-prod.azureedge.us/sites/default/files/resource-files/Farm-to-School-LitReview.pdf

Boutros, B. A., Roberts, K. R., Lin, N., & Sauer, K. L. (2019). Food traceability in school foodservice operations: Challenges and benefits. *Journal of Child Nutrition & Management*, *43*(1). https://schoolnutrition.org/uploadedFiles/5_News_and_Publications/4_The_Journal_of_Child_Nutrition_and_Management/Spring_2019/Food-Tracability-in-School-Foodservice-Operations-Spring2019.pdf

Carstens, C. K., Salazar, J. K., & Darkoh, C. (2019). Multistate outbreaks of foodborne illness in the United States associated with fresh produce from 2010 to 2017. *Frontiers in Microbiology*, *10*, 1–15. https://doi.org/10.3389/fmicb.2019.02667

Centers for Disease Control and Prevention. (2025). *Bacteria, Enterics, Ameba, and Mycotics dashboard*. https://wwwn.cdc.gov/norsdashboard/

Conference for Food Protection. (2025). *Manager certification*. https://foodprotect.org/Certification

Elnakib, S., Landry, M. J., Farris, A. R., & Shanks, C. B. (2024). Strategies to address food waste in K–12 schools: A narrative review. *Journal of Child Nutrition & Management*, *48*(1). https://schoolnutrition.org/journal/spring-2024-strategies-to-address-food-waste-in-k-12-schools-a-narrative-review/

Fink, A. (2010). Survey research methods. In P. Peterson, E. Baker, & B. McGaw (Eds.), *International Encyclopedia of Education* (3rd ed., pp. 152–160). Elsevier. https://doi.org/10.1016/B978-0-08-044894-7.00296-7

Food and Drug Administration. (2022). *Food Code*. https://www.fda.gov/food/retail-food-protection/fda-food-code

Food and Drug Administration. (2024). *FSMA Final Rule: Produce Safety*. https://www.fda.gov/food/food-safety-modernization-act-fsma/fsma-final-rule-produce-safety

Grisamore, A., & Roberts, K. R. (2014). Food recall attitudes and behaviors of school nutrition directors. *Journal of Child Nutrition & Management*, *38*(2). https://schoolnutrition.org/uploadedFiles/5_News_and_Publications/4_The_Journal_of_Child_Nutrition_and_Management/Fall_2014/FoodRecallAttitudesBehaviorsSchoolNutritionDirectors.pdf

Hayes, C., & FitzSimons, C. (2025). *The reach of school breakfast and lunch during the 2023–2024 school year*. Food Research & Action Center. https://frac.org/wp-content/uploads/Reach-Report-2025.pdf

Lorig, K. R., & Holman, H. R. (2003). Self-management and education: History, definition, outcomes, and mechanisms. *Annals of Behavioral Medicine*, *26*(1), 1–7. https://doi.org/10.1207/S15324796ABM2601_01

National Center for Education Statistics. (2021). *Public school students are eligible for free or reduced-price lunch*. https://nces.ed.gov/fastfacts/display.asp?id=898

Orfaly, R., Frances, J. C., Campbell, P., Whittemore, B., Joly, B., & Koh, H. (2005). Train-the-trainer as an educational model in public health preparedness. *Journal of Public Health Management and Practice*, *11*(6), S123–S127. https://journals.lww.com/jphmp/toc/2005/11001

Paez, P., Sauer, K., & Roberts, K. (2024). Produce food safety and farm to school initiatives: School nutrition personnel perspectives. *Journal of Child Nutrition & Management*, *48*(1). https://schoolnutrition.org/journal/spring-2024-produce-food-safety-and-farm-to-school-initiatives-school-nutrition-personnel-perspectives/

Pearce, J. (2024, April). Leading the 6-generation workforce. *Harvard Business Review*. https://hbr.org/2024/04/leading-the-6-generation-workforce

SCHOOL NUTRITION ASSOCIATION

Pearce, J., Mann, M. K., Jones, C., van Buschbach, S., & Olff, M. (2012). The most effective way of delivering a train-the-trainers program: A systematic review. *Journal of Continuing Education in the Health Professions*, *32*(3), 215–226. https://doi.org/10.1002/chp.21148

Roberts, K. R., Sauer, K. L., Paez, P., Shanklin, C., & Alcorn, M. (2018). *Behavioral assessment study: Changing food safety practices of school nutrition employees, Phase I*. The Center of Excellence for Food Safety Research in Child Nutrition Programs. https://www.cnsafefood.k-state.edu/research/Behavior-Assessment-Report-Phase-I.pdf

Roberts, K. R., Sauer, K., Paez, P., & Alcorn, M. (2020). Use of the theory of planned behavior to determine food safety behavioral intentions among child nutrition employees. *Food Protection Trends*, *40*(6), 424–434. https://foodprotection.org/members/fpt-archive-articles/2020-11-use-of-the-theory-of-planned-behavior-to-determine-food-safety-behavior-intentions-among-c/

Rubak, S., Mortensen, L., Ringsted, C., & Malling, B. (2008). A controlled study of the short- and long-term effects of a train-the-trainers course. *Medical Education*, *42*(7), 693–702. https://doi.org/10.1111/j.1365-2923.2008.03044.x

Ryan, P. (2009). Integrated theory of health behavior change: Background and intervention development. *Clinical Nurse Specialist*, *23*(3), 161–170. https://doi.org/10.1097/NUR.0b013e3181a42373

Sauer, K., Roberts, K., Paez, P., Cole, K., & Shanklin, C. (2021). Food defense practices in school nutrition programs. *Journal of Child Nutrition & Management*, *45*(1). https://schoolnutrition.org/journal/spring-2021-food-defense-practices-in-school-nutrition-programs/

Schmidt, R., & Schlottmann, A. (2024). *Does school district size matter?* https://nevadapolicy.org/wp-content/uploads/2024/09/20071126_District_Size.pdf

School Nutrition Association. (2025). *School meal statistics*. https://www.fda.gov/food/fda-food-code/food-code-2022

ServSafe. (2025). *Regulatory requirements*. https://www.servsafe.com/ss/regulatory/default.aspx

Strohbehn, C., Jun, J., & Arendt, S. (2014). School foodservice employees' perceptions of practice: Differences by generational age and hours worked. *Journal of Child Nutrition & Management*, *38*(1). https://schoolnutrition.org/wp-content/uploads/2023/01/School-Foodservice-Employees-Perceptions-of-Practice-Differences-by-Generational-Age-and-Hours-Worked-Spring-2014.pdf

Suhrheinrich, J. (2011). *Examining the effectiveness of a train-the-trainer model: Training teachers to use pivotal response training*. Society for Research on Educational Effectiveness. https://files.eric.ed.gov/fulltext/ED518863.pdf

U.S. Department of Agriculture, Food and Nutrition Service. (2021). *Professional standards for school nutrition program professionals*. https://fns-prod.azureedge.us/sites/default/files/resource-files/Professional_Standards_Flyer.pdf

U.S. Department of Agriculture, Food and Nutrition Service. (2022). *Fresh Fruit and Vegetable Program*. https://www.fns.usda.gov/ffvp/fresh-fruit-and-vegetable-program

U.S. Department of Agriculture, Food and Nutrition Service. (2024a). *Buy American provision*. https://www.fns.usda.gov/cn/buy-american-provisions

U.S. Department of Agriculture, Food and Nutrition Service. (2024b). *National School Lunch Program meal pattern*. https://www.fns.usda.gov/school-meals/nutrition-standards/nslp-meal-pattern

U.S. Department of Agriculture, Food and Nutrition Service. (2024c). *School Breakfast Program meal pattern*. https://www.fns.usda.gov/school-meals/nutrition-standards/sbp-meal-pattern

U.S. Department of Agriculture, Food and Nutrition Service. (2025). *Produce Safety University*. https://www.fns.usda.gov/fs/produce-safety/psu

U.S. National Science Foundation. (2025). *Frequently asked questions related to research involving human subjects*. https://www.nsf.gov/funding/faq/research-involving-human-subjects

United States Department of Agriculture. (2014). *Fact sheet: Healthy, Hunger-Free Kids Act school meals implementation*. https://www.usda.gov/about-usda/news/press-releases/2014/05/20/fact-sheet-healthy-hunger-free-kids-act-school-meals-implementation

United States Department of Agriculture. (2024). *Farm to School Census: Farm to School is going strong*. https://farmtoschoolcensus.fns.usda.gov/

Walshe, R., Evans (Snowy), N., & Law, L. (2024). School gardens and student engagement: A systematic review exploring benefits, barriers, and strategies. *Issues in Educational Research*, *34*(2), 782–800. https://www.iier.org.au/iier34/walshe.pdf

Journal OF CHILD NUTRITION & MANAGEMENT

VOLUME 50 | ISSUE 1 | SPRING 2026

Published by the School Nutrition Association

Wu, M., Zhao, K., & Francisca, F. (2022). Response rates of online surveys in published research: A meta-analysis. *Computers in Human Behavior Reports*, *7*, 100206. https://doi.org/10.1016/j.chbr.2022.100206

Świątkowski, W., Surret, F. L., Henry, J., Buchs, C., Visintin, E. P., & Butera, F. (2024). Interventions promoting pro-environmental behaviors in children: A meta-analysis and a research agenda. *Journal of Environmental Psychology*, *96*, 102295. https://doi.org/10.1016/j.jenvp.2024.102295

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Challenges, Concerns, and Support Needs to Implement the Added Sugar Regulation: Perspectives of Oklahoma Child Nutrition Directors

- Taylor Peabody, MPH, RD, Cassidy Ring, MS, CHES, and Deana Hildebrand, PhD, RD

KEYWORDS: school nutrition, added sugars, challenges and concerns, support needs, speed scratch cooking

INTRODUCTION:

Excessive consumption of added sugars remains a significant public health concern (2025 Dietary Guidelines Advisory Committee [DGAC], 2024). Current evidence indicates most Americans, including children, exceed the Dietary Guidelines for Americans recommendation for added sugars (Centers for Disease Control, 2024; U.S. Department of Agriculture, Food and Nutrition Service [USDA FNS], 2024a). An estimated 74–85% of children ages 5–18 years consume more than 10% of their daily energy from added sugars, increasing their risk of obesity and related comorbidities (DGAC, 2024). This is particularly concerning for this age group because foods high in added sugars, such as sugar-sweetened beverages, desserts, and sweet snacks, are often high in energy and low in nutrients, displacing nutrient-dense foods such as fruits, vegetables, and whole grains (DGAC, 2024; USDA FNS, 2022).

A 2021 study found that 92% of school breakfasts and 69% of school lunches prepared in the 2014–2015 school year exceeded the Dietary Guidelines for Americans' recommendations for added sugars (Fox et al., 2021). The primary contributor was flavored skim milk, which accounted for over one quarter of added sugars at breakfast and nearly half at lunch. Other leading sources at breakfast included cereals, condiments and toppings, muffins and breads, and granola and breakfast bars.

To align with the 2020–2025 Dietary Guidelines for Americans and reduce added-sugar consumption among school-age children, the school meal nutrition standards were updated to include limits on added sugars, implemented in two phases (USDA FNS, 2024a). As of school year 2025–2026, schools must implement Phase 1, which limits the amount of added sugars in cereals, yogurts, and flavored milks. In school year 2027–2028, Phase 2 will introduce a weekly limit on added sugars, with added sugars accounting for no more than 10% of total calories, in addition to the product-specific limits established in Phase 1. Dividing the regulation into two phases is intended to ease some of the immediate strain on those planning, preparing, and serving school meals; however, the added sugars limits introduce another layer to an already complex set of regulations (USDA FNS, 2024a).

A comment from a group of elected officials included in the Child Nutrition Programs: Meal Patterns Consistent with the 2020–2025 Dietary Guidelines for Americans Final Rule stated, “strong school nutrition requirements

are one of the most important public health achievements in a generation" (USDA FNS, 2024a). Although schools are among the healthiest food environments for children due to existing nutrition standards, efforts to further strengthen requirements must consider the full context of implementation, including procurement, meal preparation, and student participation and consumption (Jenkins, 2021; USDA FNS, 2024a).

While public comments on the Final Rule identified both concerns and potential solutions, it is critical that the child nutrition professionals implementing the standards contribute directly to the evidence base informing policymakers (USDA FNS, 2024a). As one Registered Dietitian noted in a comment, the perspective of those who apply the guidelines daily to feed children healthy meals is essential to successful implementation. At the time of this study, no published research described the operational changes required for school nutrition programs to efficiently meet the added sugars requirements or the challenges associated with doing so. Research examining these needs is necessary to support effective and efficient implementation. Therefore, the objective of this study was to explore the challenges, concerns, and support needs of school nutrition professionals related to the added sugars regulation through interviews with Oklahoma child nutrition directors (CNDs).

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METHODOLOGY:

This study was conducted by Cooking for Kids Oklahoma in two phases. In phase 1, researchers hosted an online focus group with the Oklahoma State Department of Education (OSDE) Child Nutrition team to refine the questions for phase 2 semi-structured interviews with CNDs. This study was approved by the Oklahoma State University Institutional Review Board (IRB–24–468) on 10/23/2024.

Sample

Participants in phase 1 were members of the OSDE Child Nutrition team, including Regional Program Specialists (RPSs) who supervise child nutrition programs in one of 16 multi-county regions. Researchers contacted the OSDE Child Nutrition Program Director to request an online focus group meeting with the Child Nutrition team in November 2024. Only members of this team were invited, satisfying the inclusion criteria. At the end of the focus group, RPSs were asked to assist with phase 2 recruiting by providing contact information for two lead child nutrition professionals from self-operated districts participating in a federal child nutrition program.

All 16 RPSs provided two contacts, yielding 32 potential participants who were contacted via email in January 2025 with study information and participation instructions. After two weeks, a reminder email was sent to non-respondents. Five declined participation, and one was no longer employed in child nutrition. After follow-up, the RPS from the one unrepresented region was asked to submit an additional contact to ensure statewide representation (Anderson, 2010). All phase 2 participants met the inclusion criteria of being their respective district's lead child nutrition professional, referred to hereafter as the child nutrition director (CND).

Data Collection

Phase 1 data were collected through a one-hour recorded Zoom focus group in fall 2024. Researchers used semi-structured questions and gathered feedback to refine the interview guide for phase 2. Phase 2 data were collected through an online survey and recorded Zoom or phone interviews with CNDs. Interested participants completed an online survey to provide demographic information and schedule an interview. Consent was provided by advancing past the consent page in the survey. Interviews were conducted in early SPRING 2026 and followed a semi-structured format that allowed for clarifications and probing.

Secondary data from the Oklahoma State Department of Education (OSDE, 2025) and the U.S. Department of Agriculture, Economic Research Service (USDA ERS, 2024) supplemented demographic information collected from participants. The publicly available OSDE Community Eligibility Provision (CEP) and Low-Income reports provided information on CEP eligibility and free or reduced-price meal participation (OSDE, 2025). The USDA Economic Research Service Rural-Urban Continuum Codes (RUCC) dataset, which categorizes counties by population and urbanization, was also downloaded from a publicly available webpage (USDA ERS, 2024).

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Data Analysis

Participant contact information, survey data, and secondary data were downloaded to Microsoft Excel. Transcripts generated by Zoom and iPhone were downloaded to Microsoft Word and cleaned and deidentified by researcher 1, with clarification assistance from researcher 2. Transcripts were uploaded to Dedoose (Dedoose Version 10.0.34, Los Angeles, CA) and coded using a grounded theory approach to gain understanding of the challenges, concerns, and support needs participants expressed (Bradley et al., 2007). All transcripts were coded ad hoc by researcher 1, with codes refined iteratively until a codebook was developed. Researcher 1 then re-reviewed all transcripts to ensure consistent coding. To establish inter-coder reliability, researcher 2 independently coded three randomly selected transcripts (13.6% of the data) using the codebook established by researcher 1. The researchers discussed the minimal discrepancies until they reached 100% agreement. Researcher 1 revised the codebook to reflect the agreement discussion, then both researchers applied it to one additional transcript to confirm reliability (18.2% of the data). With 100% agreement achieved with no changes to the codebook, researcher 1 then coded the remaining transcripts using the finalized codebook (Campbell et al., 2013; O'Connor & Joffe, 2020).

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RESULTS AND DISCUSSION:

Eighteen members of the OSDE Child Nutrition team, including all 16 RPSs, participated in the focus group. Of the 33 CNDs invited to participate in phase 2, 22 (66.7%) completed interviews, lasting 27–63 minutes. All 16 OSDE regions were represented, with six regions providing two participants. Fifteen counties were represented, with just under half classified as rural (USDA ERS, 2024). Most districts (86.4%) had free and reduced rates (labeled as % Low Income in Table 1) above 50%, and seven districts participated in CEP, including three in at least one school and four district-wide (OSDE, 2025). Participants reported a range of job titles, including child nutrition director, assistant director, cafeteria manager/director, and superintendent. Approximately one quarter reported never preparing or serving food, another quarter did so as a primary part of their role, and the remaining half indicated they assist with preparation as needed. Table 1 presents the demographic characteristics of the participants and their district.

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Table 1. *Participant and District Characteristics*

Participant Characteristics				District Characteristics			
Participant (P)	**Position Title**	**Prepares Food**	**Years in Position**	**Metro Site[a]**	**Enrollment[b]**	**% Low Income[b]**	**# of CEP Sites[c]**
1	Child Nutrition Assistant Director	Sometimes	3	Metro	2,826	59.2	0
2	Cafeteria Manager/ Supervisor	Main job	7	Metro	687	11.4	0
3	Food Service Director	Sometimes	8	Metro	1,919	88.7	4
4	Food Service Director	Main job	13	Metro	1,307	94.7	3
5	Director of Child Nutrition	Never	0.5	Metro	25,746	33.5	0
6	Child Nutrition Director	Sometimes	2	Metro	12,087	87.9	19
7	Director	Sometimes	13	Nonmetro	854	84.1	5
8	Child Nutrition Director	Sometimes	5	Nonmetro	1,355	47.8	0
9	Child Nutrition Director	Sometimes	4	Metro	582	83.2	2
10	Cafeteria Manager/Director	Main job	2	Metro	588	72.5	3
11	Nutrition Director	Never	2	Nonmetro	3,008	85.8	6
12	Director of Child Nutrition Services	Sometimes	20	Nonmetro	3,329	≥95	7
13	Superintendent/Child Nutrition Director	Sometimes	7	Nonmetro	501	84.2	0
14	Manager	Main job	11	Nonmetro	187	47.6	0
15	Assistant Superintendent	Never	5	Metro	2,998	81.8	5
16	Child Nutrition Director	Main job	1	Nonmetro	710	82.8	0
17	Child Nutrition Director	Never	–	Metro	32,707	≥95	57

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18	Child Nutrition Director	Sometimes	5	Nonmetro	514	74.5	0
19	Director of Child Nutrition	Never	2	Metro	14,950	76.9	0
20	Director of Child Nutrition	Sometimes	3	Metro	19,882	50.6	0
21	Child Nutrition Director	Sometimes	20	Nonmetro	309	66.3	0
22	Cafeteria Director	Main job	2	Nonmetro	261	84.3	3

[a] 2023 Rural-Urban Continuum Codes Dataset (USDA ERS, 2024)

[b] 2025 Low Income Report (OSDE, 2025)

[c] 2025 Community Eligibility Report (OSDE, 2025)

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The interviews revealed an extensive catalog of challenges, concerns, and support needs related to implementing the added sugars limits in school nutrition programs. Illustrative quotes in Tables 2, 3, and 4 provide evidence of data interpretation and highlight key findings (Machado et al., 2022; Yeo & Han, 2025).

Challenges and Concerns Regarding the Added Sugars Regulation

At the time of the study, all 22 participants reported challenges related to the added sugars regulation. Phase 1 product-based limits raised concerns about product availability, cost, and student acceptance. Phase 2 percentage-based limits highlighted broader operational challenges, including menu planning, procurement, and preparation, as programs considered adaptation strategies such as moving to savory, protein-focused menus and speed scratch cooking.

Lack of Clarity

Many participants wanted to begin changes gradually so staff and students could adjust; however, uncertainty regarding the 10% limit, such as how it functions and how Phase 1 interacts with Phase 2, limited confident planning (Table 2, Quotes 1–3). A participant expressed concern about purchasing new products prematurely, noting the potential financial and logistical burdens of acting on incomplete information.

In addition to regulatory uncertainty, some participants were unclear about what ingredients contribute to added sugars (Table 2, Quote 4). Participants also questioned the potential use of artificial sweeteners in reformulated products and noted the absence of clear guidance (Table 2, Quote 5). The uncertainty extended beyond child nutrition operators, with one participant recalling a manufacturer expressing disbelief that the regulation would be carried out.

Balancing Compliance with Menu Variety and Appeal

Participants anticipated difficulty meeting the new limits without reducing menu variety or student appeal. Several participants noted that if commercially prepared breakfast items such as cinnamon rolls, donuts, and breakfast bars aren't reformulated, menu cycles will likely be shortened, leading to menu fatigue and reduced student satisfaction (Table 2, Quotes 6–8).

Several participants plan to introduce more savory or protein-based items to manage added sugars, but these items are typically higher in cost, sodium, and saturated fat, complicating compliance with other nutrient standards (Table 2, Quotes 9–10). Participants expressed particular concern about balancing the added sugars limits with the 2027 sodium targets (USDA FNS, 2024b).

Financial Constraints

Participants said the lower breakfast reimbursement rate is already a challenge, and more funding would help them implement the added sugars limits. They explained that any time a manufacturer reformulates a product to meet new standards, costs are passed down to schools (Table 2, Quote 11). As a result, products reformulated to reduce added sugars will likely be more expensive.

Menu planning strategies, such as replacing sweet items with higher-protein savory items, were discussed as a possible solution, but these items can be expensive (Table 2, Quote 12). Participants discussed using speed scratch cooking to reduce dependence on commercial products, but this requires balancing lower food costs with higher labor costs (Table 2, Quotes 13–14). Additionally, not all kitchens are equipped to support this production model and may require significant financial investment in culinary skill training and equipment. Overall, participants agreed that the added sugar limits will have financial repercussions (Table 2, Quotes 12, 14–15).

Staffing Capacity and Workforce Challenges

Participants described difficulty recruiting, retaining, and promoting staff due to low financial compensation (Table 2, Quotes 16–17). Even when staffing allocations technically meet enrollment-based standards, programs may still be operationally understaffed (Table 2, Quote 18). Breakfast production was described as particularly demanding because of limited labor hours, short production time, and competing production priorities. Several noted breakfast preparation often falls to a single kitchen manager, as staff start times must be staggered to ensure adequate coverage for the day (Table 2, Quote 19). Participants worry the added sugars limits will further strain staff capacity (Table 2, Quote 20).

Regarding speed-scratch cooking as a possible solution, participants said labor hours and culinary skills would be barriers, as their employees are accustomed to heat-and-serve preparation and lack the training needed for efficient baking and speed-scratch cooking (Table 2, Quotes 21–23). They emphasized the need for targeted professional development to build the skills needed to produce appealing and compliant menu items.

Product and Vendor Concerns

Participants questioned whether manufacturers will reformulate products to meet the new standards and whether those products will be available in sufficient quantities, particularly in rural areas, where limited availability can already disrupt operations (Table 2, Quotes 24–25). They also worried about declines in product quality and flavor, noting reductions in sodium, saturated fat, and now added sugars could negatively affect flavor (Table 2, Quotes 24, 26–27).

A few participants said their menu-planning and nutrient-analysis software programs lacked fields or functions for tracking added sugars. They questioned when the nutrient analysis function and product databases would be updated, and how ingredients such as sugar and honey would be handled by the software when the labels of these ingredients list only total sugars, even though they contribute added sugars in recipes (Table 2, Quotes 28–29). Overall, participants expressed frustration with the lack of communication from software companies because they rely on these systems to ensure compliance. One participant even raised the question of whether the current software would retain USDA approval, given their lack of added sugars functionality (Table 2, Quote 29).

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Student Acceptance and Participation Impacts

Participants indicated that younger students often prefer sweet breakfast foods and were concerned that lower-sugar products or recipes might affect student acceptance, leading to increased food waste and reduced participation (Table 2, Quotes 30–33, 35). Some who had already introduced lower-sugar products said students reacted negatively because they could both taste the difference and see it on the package labeling (Table 2, Quotes 31–32).

Participants identified several consequences of declining participation at breakfast, including reduced classroom readiness, lower academic outcomes, and missed opportunities to address childhood hunger (Table 2, Quotes 33–34). A participant challenged the notion that 'if they're hungry, they'll eat,' explaining that young children don't think that way. From an operational standpoint, lower participation reduces reimbursement revenue, creating a cycle of financial strain that limits the ability to invest in program improvements (Table 2, Quote 35).

Overall, participants feared they may struggle to meet the added sugars requirements without compromising meal quality or operational stability.

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Table 2. *Representative Participant Quotes Highlighting Challenges and Concerns*

Lack of Clarity	
10 out of 22 participants expressed this concern: P2, P7, P8, P9, P11, P12, P14, P17, P19, and P22	
Quote 1	"How do we change that without knowing what to change it to? . . . I'm not sure how to really implement it [the added sugars regulation] into our district at this point. It really—there's so many things that are up in the air with that, like, we don't know how—we know what the rule is, but we don't know how to implement it, yet or how to teach it." (P22)
Quote 2	"It [Phase 2] sure is wide open" (P7)
Quote 3	"If the milk counts in there as part of your 10%, I mean, that's going to be really hard" (P9)
Quote 4	"I don't know which ones [ingredients] contain an added sugar thing" (P8)
Quote 5	"When we say lower sugar, are they substituting that sugar out for aspartame?" (P2)
Balancing Compliance with Menu Variety and Appeal	
20 out of 22 participants expressed this concern: P1, P2, P3, P4, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P17, P18, P19, P20, P21, and P22	
Quote 6	"As of right now, as my current menu stands, I'll have to take several things off of it and the rotation—right now I'm on a 4 week menu cycle and I'll probably have to drop that down." (P1)
Quote 7	"Variety of things that the kids—that we can serve at breakfast is going to be less unless our manufacturers catch up." (P12)
Quote 8	"We can only serve them biscuits and gravy so many days in a row or in a month" (P22)
Quote 9	"Every time we put those [savory items] in there [the menu planning software], our nutritionals pop red because they're like 'You have too much fat, redo it.'" (P17)
Quote 10	"I have a hard time with the sodium to get everything in to meet my weekly limits and my daily limits. I'm having a hard time adding protein, even though I want to add protein. And I feel like this [the added sugars limits] is just gonna make it a little harder, even with all of that." (P18)
Financial Constraints	
14 out of 22 participants expressed this concern: P1, P4, P5, P7, P9, P12, P13, P14, P16, P17, P18, P19, P20, and P22	
Quote 11	"Anytime a manufacturer has to reformulate a product to be CN labeled, those costs are passed to us, they're absolutely passed to us." (P17)
Quote 12	"All of those things that have more protein in them, more cheese, more chicken, beef, whatever, they cost more, the dollar amount, and you're not being reimbursed as much at breakfast as you are at obviously lunch" (P19)
Quote 13	"I mean ideally, scratch cooking would be the best option [to help meet the added sugars limits]" (P12)

Quote 14	"If I have to serve things that are not already prepackaged and do more speed scratch or fast scratch items, then that cuts into my labor hours. And so that's a concern for me. I don't know how logistically I would do that. . . . it will be a financial burden if we have to bring more people in earlier." (P1)
Quote 15	"It costs more for more higher protein options and so I think we need more funding if we're expected to serve more protein and less sugar . . . I think if you're going to more labor at breakfast, we would need more money for that too." (P5)
Staffing Capacity and Workforce Challenges	
19 out of 22 participants expressed this concern: P1, P4, P5, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P17, P18, P19, P20, P21, and P22	
Quote 16	"We don't pay enough for anybody to want to come to work in here, so I mean, like I'm working tons of hours" (P10)
Quote 17	"They [managers] don't get paid very much money to be required to know all this information, and you know, work as hard as they do, it's hard to find people that want to step up and do it [become a manager]." (P4)
Quote 18	"I know that they hire people, and it goes along with your enrollment, but we're just shorthanded" (P14)
Quote 19	"Our managers usually come in and do breakfast on their own so that they have their staff long enough at the end of the day to clean up." (P5)
Quote 20	"implementing [the added sugars limits] adds on to our already stressed-out child nutrition workers" (P13)
Quote 21	"We would really have to ease into that [scratch cooking] because my employees aren't—not that they're not capable, they're just not used to doing that" (P12)
Quote 22	"Do I have the labor force and the culinary skills in my kitchens for them to be able to do that [speed scratch cook]?" (P17)
Quote 23	"I think if we were gonna go back to like making scratch breakfast items like baking, or anything like that, we would need [training]. Like our people don't know how to do that anymore, they used to, but we don't do that anymore" (P5)
Product and Vendor Concerns	
20 out of 22 participants expressed this concern: P1, P4, P5, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P17, P18, P19, P20, P21, and P22	
Quote 24	"A lot of the problems are going to be dealing with the manufacturers—Can they get there? Can they do it? Can they provide more quality options that taste good? . . . my biggest concern is just manufacturer compliance right now." (P19)
Quote 25	"it will force us to back away from some of those heat-and-serve items. If they are not reformulated to fit the standards, we can't use them [manufactured products]" (P6)

Quote 26	"So, and then—so they take, you know, they've taken a lot of the fats, total fat and saturated fat and sodium, and so—but they've never taken sugar. So that's sort of like what every manufacturer is relying on to get any type of flavor in there, is sugar. So, if they want us to make palatable foods, we're gonna need more fat, saturated fat, and sodium allowances." (P5)
Quote 27	"Biggest concerns is what I've already stated about being able to get the products, and then the quality of the taste—I think they can make that work, but you never know until you actually get to taste it. But they've already taken so—put so many regulations in that we're—the quality of the food has gone down a little bit." (P15)
Quote 28	"We use Mosaic Back of House, and so we run all of our menus through that to make sure that we're meeting all of the weekly requirements. So is Mosaic gonna go in and make those requirement changes [to include added sugars] for us?" (P12)
Quote 29	" We have Nutrikids, and no, currently, there is not a place to even [see the added sugars]—how are we supposed to even figure that? . . . are these softwares approved now? Or not approved now because the added sugar isn't in there? I don't know. I haven't heard anything from Heartland—who's the parent company of Nutrikids—if they are—if there's going to be some kind of upgrade this summer. Because what's the timeline?" (P19)
Student Acceptance and Participation Impacts	
21 out of 22 participants expressed this concern: P1, P2, P3, P4, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20, P21, and P22	
Quote 30	"The kids just aren't going to want to eat" (P10)
Quote 31	"[Students are] griping already. . . . they know number one, what it's supposed to taste like, and number two, it's written all over the package." (P3)
Quote 32	"It's just hard when the foods that they get outside of the school taste like—and then they come here, and they don't want to eat it, because it doesn't taste normal to them." (P4)
Quote 33	"If our food doesn't taste good, that's right where it's going [to the trash can], and that does nothing to curb childhood hunger at all." (P14)
Quote 34	"The child nutrition program is within the top concerns that I have every day as a school superintendent, not only because I'm the child nutrition director, but because I'm concerned about student outcomes academically." (P13)
Quote 35	"If your participation drops, well, then your reimbursement drops, and then you're just in the cycle—then I don't have enough money to buy the things that, you know, cost more, and it's—you know, it's just a spiral." (P19)

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Not Concerned

During the interviews, 16 participants indicated there was at least one area regarding the added sugars limits they were not concerned about. However, those participants expressed concerns elsewhere, indicating no participant was entirely unconcerned. Most participants who expressed a lack of concern were confident that manufacturers and distributors would provide compliant products (Table 3, Quotes 1–2). Other common reasons included being mostly or fully compliant with Phase 1 (Table 3, Quotes 3–4), not serving many high sugar items (Table 3, Quotes 5–6), already incorporating some scratch cooking (Table 3, Quotes 7–8), and not expecting participation to decline (Table 3, Quotes 9–10). Less common reasons included confidence in updating menus, recipes, and procurement to control added sugars (Table 3, Quotes 11–13), ease of adaptation in smaller districts (Table 3, Quote 14), being more concerned about other issues (Table 3, Quote 15), and using maple-infused products to avoid breakfast syrup (Table 3, Quote 16).

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Table 3. *Representative Participant Quotes Highlighting Reasons Participants were Not Concerned*

Confident in Manufacturers and Distributors Providing Compliant Products	
7 out of 22 participants shared this perspective: P2, P5, P10, P15, P18, P21	
Quote 1	"I feel pretty confident that they [suppliers] can [get the products they need]. . . . the vendors will still make money off of the product. And we're just gonna need a product that meets the requirement. . . . So, I feel pretty good about it." (P15)
Quote 2	"I was telling my ladies, I was like, 'I'm not gonna panic yet. I'm gonna give them–'I mean, Ben E Keith is who I order from almost exclusively and they cater to schools, their companies, you know, they carry products that cater to schools so I feel like they'll be on top of that as much as we are trying to fix it because they're gonna want to sell those things to us. That's just my opinion. I don't know if they can get it done fast enough, or if they will, but I feel like they will." (P18)
Already Mostly or Fully Compliant with Phase 1	
6 out of 22 participants shared this perspective: P5, P6, P7, P8, P9, and P22	
Quote 3	"The chocolate milk and the white milk, it's already in compliance. Yogurt for us is already in compliance . . . my cereal already is in compliance . . . next year, I do not see it as a huge issue next year at all." (P7)
Quote 4	"The first Phase we are—well pretty much already meeting that, there are only like one or two cereals that do not meet the requirements, but as far as flavored milk and yogurt, we're already doing Phase 1." (P5)
Does Not Serve Many High Sugar Items	
4 out of 22 participants shared this perspective: P3, P15, P16, and P22	
Quote 5	"I mean, right now it's not a lot of sugar [on the menu], honestly." (P16)
Quote 6	"It's [the added sugars regulation] going to affect us just a little bit, but I don't think it's going to affect us a lot. We don't do a lot of sugars" (P22)
Already Incorporates Some Scratch Cooking	
4 out of 22 participants shared this perspective: P3, P9, P10, and P22	
Quote 7	"I am glad that we do more scratch, I think it's probably less sugar than the heat and eat items so we might be good there" (P3)
Quote 8	"At that point, I'm pretty sure we could handle making the breakfasts and everything from scratch" (P22)
Not Expecting Participation to Decline	
3 out of 22 participants shared this perspective: P8, P10, and P15	

Quote 9	"If we can get the right amount of stuff, they [students] may not ever notice that we have done a little playing with their stuff, you know." (P8)
Quote 10	When asked if they were worried about participation decreasing participant 15 said, "I think we can hold to the—to an even balance because we're dealing with—my district is a high free and reduced district of about 80%, around there, and so those kids are gonna be getting fed anyway." (P15)
Confident in Updating Menus, Recipes, and Procurement to Control Added Sugars	
4 out of 22 participants shared this perspective: P1, P2, P6, and P20	
Quote 11	"I can update my menus, I can update the recipes, it just takes time. So, I'm not that concerned about it. . . . as far as the execution of writing the menu and rolling it out, I think I can handle that without any stress. . . . the software I use in Health-e Pro makes it easy; I can go in and make whatever kind of adjustments you know." (P1)
Quote 12	"If we're not able to have the cereal selection, well, we can fall back and do whether it's the cheese omelet and making sure that that meets regulation, and do oatmeal and not have sugar in it" (P2)
Quote 13	"I feel comfortable in finding alternative things for our kids." (P6)
Ease of Adaptation in Smaller Districts	
1 out of 22 participants shared this perspective: P2	
Quote 14	"With us being such a small school, and we're just one school in this district that it's not—I don't think for us to get product, isn't going to be as difficult as I think it would be for a bigger district and trying to get product. I think we're easier to adapt." (P2)
More Concerned About Other Issues	
1 out of 22 participants shared this perspective: P6	
Quote 15	"I think that's [staffing is] the one piece of the puzzle that I'm most worried about. The actual sugar being reduced, I'm not super worried about it." (P6)
Use Maple-Infused Products to Avoid Breakfast Syrup	
1 out of 22 participants shared this perspective: P19	
Quote 16	"We don't do like syrup on the side, but some of the like the pancakes are like certain maple infused, or something like that. But we actually don't do any of the dipping sauces with them." (P19)

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Support Needs

Participants were asked what support they needed to help reduce added sugars in their programs. All participants offered input on the knowledge, resources, and training they felt were necessary to implement the new limits effectively.

Training and Resources

Training and resource needs included information about the added sugars regulation, recipes and menus, and culinary skill development. Participants wanted clear information on the regulatory requirements for added sugars for themselves, their staff, and their communities (Table 4, Quote 1). Due to confusion about added sugars, participants emphasized the need for training that builds foundational understanding of what added sugars are and how to identify them on the Nutrition Facts label. While preferences differed on the level of detail, all participants supported the creation of concise, customizable training materials that provide consistent, easy-to-understand information.

Participants requested low-added-sugar recipes with accompanying operational information such as preparation time, required equipment, advance-prep instructions, photos, or short demonstration videos, and serving prompts (Table 4, Quote 2). They also wanted sample menus that meet Phase 2 requirements while retaining familiar, student-approved items. Participants indicated recipes and menus alone are not sufficient for programs accustomed to heat-and-serve models, and called for culinary training in baking, flavor-enhancing methods, and presentation and service strategies (Table 4, Quote 3). Workflow and supervisory training for managers is also needed to promote kitchen efficiency.

Participants want training and resources as soon as possible so they can begin adjusting before Phase 2 takes effect (Table 4, Quote 4). They suggested scheduling live training on professional development days or after lunch service. Unfortunately, several participants said insufficient staffing limits their ability to participate in training or utilize resources.

Collaboration

Many participants favored in-person meetings for collaborating with other child nutrition professionals to allow for richer discussion, but acknowledged virtual meetings can be more practical and are still valuable. Preferences for peer collaborators varied, with some suggesting regional or geographic groupings, while others wanted opportunities to hear ideas from districts that were demographically similar. Participants also mentioned asynchronous options such as a Facebook group or GroupMe. Regardless of format, all participants agreed that peer collaboration would help them share ideas, problem-solve, and support one another (Table 4, Quote 5).

While viewed as beneficial, challenges for participating in collaboration included limited time, travel costs, and uncertainty about whom to contact (Table 4, Quotes 6–7). To address these challenges, they suggested a state-level organization host and facilitate multiple collaboration formats.

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Advocacy

A few participants emphasized the need for stronger advocacy and communication across all levels of the child nutrition system. Several called for more positive publicity that showcases the quality, effort, and professionalism of Oklahoma child nutrition programs, helping the public appreciate the complexity of preparing and serving school meals (Table 4, Quotes 8–9). Participants also suggested resources to help communicate with vendors to ensure manufacturers understand the new regulation and the need for compliant products in sufficient quantities (Table 4, Quote 10). Finally, participants called for advocacy to improve funding, staffing structures, and compensation levels (Table 4, Quotes 11–12).

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Table 4. *Representative Participant Quotes Highlighting Support Needs*

Training and Resources	
All 22 participants discussed this support need	
Quote 1	"If there was like a high level training and then a low level training, you know what I mean, like super high level goes into all the little details [about the added sugars regulation] that you might not think of for managers, directors, and above. But then, like a low-level training for staff, like maybe a quick video or a template, or something that they could read over that explains the why and the important stuff that they need to know." (P1)
Quote 2	"I think like a like a very quick like video of just like, step by step of how the recipe kind of comes together to show like how easy it is. . . . this is a new recipe we're doing and here's a video of how we're gonna assemble it. And I think that would be a good visualization for them of what all the steps look like and what the end product should look like" (P6)
Quote 3	"training or resources on how to make foods more palatable with limited added sugar, like what you could use, or different cooking methods, you know, could help with that. . . . And then probably just cooking trainings to begin with, like how do you prepare these items and make it presentation-wise or cooking method-wise more palatable for the students." (P20)
Quote 4	"Well, having those recipes already formulated for lower sugar so we don't have to go in and make those conversions would be helpful so it's just right there. I think that would be the biggest thing because if we're looking at transitioning to scratch cooking for those lower sugar options, having something that's already done so that we could maybe implement now" (P12)
Collaboration	
21 out of 22 participants discussed this support need: P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P16, P17, P18, P19, P20, P21, and P22	
Quote 5	"If everyone could kind of brainstorm, like different districts, and talk about any lower sugar items that they're already doing that are lower sugar, high participation, and okay on cost . . . not everyone having to reinvent the wheel, like everyone share their best ideas" (P5)
Quote 6	"With your small schools, you lose this connection where there's no true director—it might be the principal, it might be the superintendent, or it might be somebody who never steps inside the kitchen that actually would get all those emails or all that stuff [communication about support and collaboration opportunities]." (P7)
Quote 7	"I feel like also a thing out here is all of us are shorthanded. And I know that they hire people and it goes along with your enrollment, but we're just shorthanded, we're busting our butts out here. So, if we did get like, you know, outreach from people that are close—

	there—a lot of the times we don't even have time to collaborate with those people, because by the time we get all done and they get all done, the only thing we want to do is go home." (P14)
Advocacy	
9 out of 22 participants discussed this support need: P1, P4, P10, P11, P13, P14, P17, P19, and P20	
Quote 8	"I think a lot of times the rules and the things that do come to us are based off of taking care of the worst problems instead of focusing on what's positive—I don't ever really see that. So, I think if there's ways for you all, the State Department. . . to start highlighting positive things that are going on in child nutrition across the state and even the nation, I think that's not something we see. . . . I'm pretty proud of what we serve. I'm pretty proud of the options that we give our kids . . . we have a dedicated staff of ladies who are working very hard and put a lot—as much heart as they do cooking skill into to what they're putting out for kids because they love the kids that they see every day. And so, I think, finding ways to highlight that and to showcase that are important steps also on the on the backside of everything that we do." (P13)
Quote 9	"Advocacy for child nutrition and what that actually looks like and how our standards should be. And you know, just communicate it because if you're not in it every day, people, they don't know." (P20)
Quote 10	"Having help reaching out to manufacturers to see if they really are ready for this, and if they know what kind of volume they'll have . . . any kind of support with the manufacturers would be fantastic" (P1)
Quote 11	"I can't get anybody to do it [be a kitchen manager]. . . . they don't get paid very much money to be required to know all this information, and you know, work as hard as they do, it's hard to find people that want to step up and do it." (P4)
Quote 12	When asked what would be helpful if you have to do more cooking at breakfast, Participant 14 said, "An actual morning person that comes in with me. . . . You know, because like I use a lot of my morning time, you know, doing my office work and things like that—like when there's nobody here, it's all silent, I like to do all my paperwork and office work and things like that. So, if I had somebody that would actually come help me do the breakfast cooking and prep, that's really what I need more than anything." She then said "My perfect plan for this child nutrition program—because we don't have an actual director, like I share those responsibilities with the lady that does our point of sale—like a perfect plan for me, would be for me to have the actual director's job and then hire a manager so that way—I just feel like it would be—run more smoothly." (P14)

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CONCLUSIONS AND APPLICATION:

This study provided CNDs the opportunity to voice their challenges, concerns, and support needs regarding the revised school meal nutrition standards. Participants anticipated significant challenges serving meals lower in added sugars, particularly at breakfast. They voiced concerns about the Final Rule lacking operational clarity, balancing compliance with menu variety, financial and staffing constraints, product availability, vendor compliance, and student acceptance and participation. Even those who were less concerned about implementation identified at least one barrier or area of uncertainty.

Procurement challenges identified in this study align with prior literature documenting concerns related to both commercial products and USDA foods (SNA, 2023, 2025a, 2025b; U.S. Government Accountability Office, 2023; USDA FNS, 2024c). In their 2021 study, Fox et al. noted the need for manufacturers to produce lower sugar products suitable for school meals. However, the School Nutrition Association (2023) reported the cost of product reformulation is passed on to schools, making it difficult for school districts to afford products that meet the standards. Discussions at the 2023 Supply Chain Summit highlighted increased reimbursement as a strategy to reduce supply chain issues (SNA, 2023). Without additional funding for school nutrition programs to back procurement, manufacturers may not sell enough volume to justify the high research and development costs associated with frequent updates to the standards and may choose to exit the school nutrition market, further limiting product availability for schools. If these challenges persist, school districts may need to move to speed scratch cooking rather than heat-and-serve manufactured products, particularly at breakfast.

Speed-scratch preparation methods can help child nutrition programs reduce added sugars and sodium while addressing growing concerns about processed foods (Zuercher et al., 2025). USDA's recent partnership with Applied Curiosity Research to gather information about fresh food preparation and scratch cooking from school food authorities highlights the relevance of this production method (USDA FNS, 2025). While speed scratch cooking can help address procurement concerns, it introduces its own considerations. Directors must increase staffing and labor hours; menu planners must create or select recipes to build menus that meet all school meal nutrition standards; kitchen managers must plan for more time- and labor-intensive preparation; and cooks must have the culinary skills to execute speed-scratch cooking and baking techniques. To be successful, training and resources on foundational cooking skills, all the way up to human resource management, are needed (Asada et al., 2017). Several participants in this study described taking, or planning to take, a proactive approach to implementing the new standards and to incorporating more speed-scratch cooking. Lessons can be learned from these districts to help develop applicable support tools. In addition, these program leaders may serve as peer collaborators for other districts.

Several commenters on the Final Rule expressed concern that overly restricted standards may reduce the appeal of school food, leading to food waste or students seeking less nutritious food sources (USDA FNS, 2024a). That concern was echoed by the CNDs in this study, who worried these changes would lower student satisfaction and participation. Understanding how recipe changes influence satisfaction can help address these concerns. Peters et al. (2018) examined how reducing added sugars and incorporating calorie-free spices

influenced recipe enjoyment, with results varying by the complexity of the recipe's flavor profile. Reducing added sugars and adding spices in simple recipes, such as oatmeal, had lower appeal, while complex recipes, such as apple crisp, maintained satisfaction ratings even with a 37% reduction in added sugars compared to the original recipe. These findings indicate that some recipes can be modified to reduce added sugars without sacrificing student satisfaction, helping identify strong candidates for reformulation. Successfully implementing these changes will require targeted training and resources to modify recipes and prepare the resulting speed scratch dishes.

Key Practice Implications

Support needs were discussed alongside challenges and concerns, offering guidance for actionable assistance opportunities. Participants identified the need for timely information and training on the added sugars limits, as well as practical resources such as culinary skill development and compliant recipes and menus. Additionally, tools for recipe modification, taste testing, and student feedback collection can help programs adapt to the new requirements. Participants also indicated that peer collaboration and information-sharing networks would support problem-solving and knowledge exchange. Finally, several participants emphasized the importance of advocacy to increase awareness of and support for child nutrition programs among decision-makers and the public.

Conclusion

This study provides insight into how federal nutrition policy translates to district-level operations and the need for balancing the provision of nutritious foods with student satisfaction and operational feasibility when modifying school meal nutrition standards. School nutrition professionals must be central contributors to these conversations. While these findings focus on the regulation of added sugars, this study can provide a framework for understanding how child nutrition programs respond to regulatory changes and the importance of school nutrition professionals contributing to the conversation. Future research on the challenges and support needs of school nutrition professionals can contribute to the knowledge base and provide supporters with actionable tasks directly from those who would benefit from their support. Further explorations in operational readiness, impacts of culinary training on student satisfaction, and the outcomes of peer collaboration would benefit the field.

Strengths and Limitations

The use of qualitative methods strengthened this study by allowing for deeper exploration of participant perspectives. Additionally, the researchers' experience from their employment with Cooking for Kids Oklahoma, a culinary training program for child nutrition professionals, contributed to their understanding of school nutrition operations and context.

This study has a few limitations. The sample was limited to Oklahoma CNDs, so the results may not be generalizable to programs in other states. The rurality of participant districts also differed from statewide demographics. According to the RUCC, 76.6% of Oklahoma counties are considered nonmetro, compared with 45.5% of the districts represented in this study (USDA ERS, 2024). This may reflect that CNDs in smaller, more

rural districts have additional food preparation responsibilities than those in larger, more urban districts, and thus have less time to participate in studies such as this. In addition, ad hoc coding prevented the calculation of formal inter-rater reliability statistics, though the coding process involved iterative discussion between researchers to reach consensus.

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ABSTRACT

PURPOSE/OBJECTIVES

The school meal nutrition standards were recently revised to include two phases of added sugars limits beginning July 1, 2025 and July 1, 2027. Phase 1 establishes product-based limits for milk, cereal, and yogurt. Phase 2 introduces a weekly limit that restricts added sugars to no more than 10% of total calories, in addition to Phase 1 limits. This study explored the challenges, concerns, and support needs of child nutrition directors (CNDs) related to the implementation of these revised standards.

METHODS

This study was conducted in two phases using a qualitative research design. Phase 1 included an online focus group with the Oklahoma State Department of Education Child Nutrition team to refine interview questions and assist with recruiting for phase 2. Phase 2 involved an online survey and virtual semi-structured interviews with CNDs. Interview transcripts were analyzed using grounded theory and were reviewed for inter-coder reliability.

RESULTS

Interviews with 22 CNDs from the 16 Oklahoma child nutrition regions revealed challenges related to both phases of the added sugars regulation. Phase 1 concerns focused on product availability, cost, and student acceptance, while phase 2 concerns highlighted broader operational challenges, including menu planning, procurement, recipe modification, and preparation. Many participants discussed speed scratch cooking as a possible solution, though they noted it would introduce additional staffing, training, and equipment challenges. While some participants were confident in their supplier support or their current compliance, all expressed at least one challenge or concern. Participants also identified specific knowledge, resources, and training needed to successfully implement the added sugars limits.

APPLICATIONS TO CHILD NUTRITION PROFESSIONALS

Oklahoma CNDs anticipated significant challenges reducing added sugars, particularly at breakfast, but emphasized the value of proactive planning, clear guidance, and relevant training. Findings illustrate how federal nutrition policy translates to district-level operations and identify actionable opportunities to support effective implementation.

SCHOOL NUTRITION ASSOCIATION

REFERENCES

2025 Dietary Guidelines Advisory Committee. (2024). *Scientific report of the 2025 Dietary Guidelines Advisory Committee*. U.S. Department of Health and Human Services & U.S. Department of Agriculture. https://doi.org/10.52570/DGAC2025

Anderson, C. (2010). Presenting and evaluating qualitative research. *American Journal of Pharmaceutical Education*, *74*(8), 141. https://doi.org/10.5688/aj7408141

Asada, Y., Ziemann, M., Zatz, L., & Chriqui, J. (2017). Successes and challenges in school meal reform: Qualitative insights from food service directors. *Journal of School Health*, *87*(8), 608–615. https://doi.org/10.1111/josh.12534

Bradley, E. H., Curry, L. A., & Devers, K. J. (2007). Qualitative data analysis for health services research: Developing taxonomy, themes, and theory. *Health Services Research*, *42*(4), 1758–1772. https://doi.org/10.1111/j.1475-6773.2006.00684.x

Campbell, J. L., Quincy, C., Osserman, J., & Pedersen, O. K. (2013). Coding in-depth semistructured interviews: Problems of unitization and intercoder reliability and agreement. *Sociological Methods & Research*, *42*(3), 294–320. https://doi.org/10.1177/0049124113500475

Centers for Disease Control and Prevention. (2024, October 3). *Get the facts: Added sugars*. https://www.cdc.gov/nutrition/php/data-research/added-sugars.html

Fox, M. K., Gearan, E. C., & Schwartz, C. (2021). Added sugars in school meals and the diets of school-age children. *Nutrients*, *13*(2), 471. https://doi.org/10.3390/nu13020471

Jenkins, A. (2021, April 12). *Study finds Americans eat food of mostly poor nutritional quality—except at school. Tufts Now*. https://now.tufts.edu/2021/04/12/study-finds-americans-eat-food-mostly-poor-nutritional-quality-except-school

Machado, S. S., Brewster, A. L., Shapiro, V. B., Ritchie, L. D., Magee, K. S., & Madsen, K. A. (2022). Implementation leadership in school nutrition: A qualitative study. *Journal of Nutrition Education and Behavior*, *54*(1), 56–64. https://doi.org/10.1016/j.jneb.2021.08.011

O'Connor, C., & Joffe, H. (2020). Intercoder reliability in qualitative research: Debates and practical guidelines. *International Journal of Qualitative Methods*, *19*, Article 1609406919899220. https://doi.org/10.1177/1609406919899220

Oklahoma State Department of Education. (2025, October 7). *Child nutrition documents*. https://oklahoma.gov/education/services/child-nutrition/documents.html

Peters, J. C., Marker, R., Pan, Z., Breen, J. A., & Hill, J. O. (2018). The influence of adding spices to reduced sugar foods on overall liking. *Journal of Food Science*, *83*(3), 814–821. https://doi.org/10.1111/1750-3841.14069

School Nutrition Association. (2023). *Supply chain summit: Resetting the narrative around K-12 supply chain*. https://schoolnutrition.org/resource/2023-supply-chain-summit-report/

School Nutrition Association. (2025a). *A Thriving community: A future vision for the school nutrition ecosystem*. https://schoolnutrition.org/resource/a-thriving-community-a-future-vision-for-the-school-nutrition-ecosystem/

School Nutrition Association. (2025b). *SY 2024/25 School nutrition trends report*. https://schoolnutrition.org/wp-content/uploads/2025/01/2024-25-School-Nutrition-Trends-Report.pdf

U.S. Government Accountability Office. (2023). *School meals: USDA should address challenges in its "Foods in Schools" program* (No. GAO-23-105697). https://www.gao.gov/products/gao-23-105697

U.S. Department of Agriculture, Economic Research Service. (2024, January 22). *Rural-urban continuum codes*. https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/

U.S. Department of Agriculture, Food and Nutrition Service. (2022). *Added sugars in school meals and competitive foods*. https://fns-prod.azureedge.us/sites/default/files/resource-files/AddedSugarsinSchoolMeals.pdf

U.S. Department of Agriculture, Food and Nutrition Service. (2024a). *Child nutrition programs: Meal patterns consistent with the 2020–2025 Dietary Guidelines for Americans*. *Federal Register*, *89*(81), 31962–32120. https://www.federalregister.gov/d/2024-08098

U.S. Department of Agriculture, Food and Nutrition Service. (2024b, April 24). *Sodium*. https://www.fns.usda.gov/cn/school-nutrition-standards-updates/sodium

U.S. Department of Agriculture, Food and Nutrition Service. (2024c). *Results of USDA's food and nutrition service-administered school food authority survey III on supply chain disruption and student participation*. https://fns-

prod.azureedge.us/sites/default/files/resource-files/ops-sfa3-scd-participation-121824a.pdf

U.S. Department of Agriculture, Food and Nutrition Service. (2025, March 24). *Current data collections*. https://www.fns.usda.gov/research/current-data-collections

Yeo, S., & Han, S. (2025). Which quotations to use? Guidance on selecting and reporting quotations in qualitative research. *International Journal of Qualitative Methods*, *24*, Article 16094069251353449. https://doi.org/10.1177/16094069251353449

Zuercher, M. D., Orta-Aleman, D., French, C. D., Cohen, J. F. W., Hecht, C. A., Hecht, K., Chapman, L. E., Read, M., Ohri-Vachaspati, P., Schwartz, M. B., Patel, A. I., Ritchie, L. D., & Gosliner, W. (2025). Factors and outcomes associated with using scratch-cooked, organic, and locally grown foods in school meals in California. *Journal of School Health*, *95*(3), 235–246. https://doi.org/10.1111/josh.13533

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