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Assessment of Nutrition Knowledge of Childcare Providers Regarding the Implementation of the 2017 CACFP Meal Pattern Update

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Abstract

Background: With the release of 2017 Child and Adult Care Food Program (CACFP) meal pattern, states need to determine knowledge gaps in order to develop targeted training materials and resources to aid childcare providers in achieving new regulations. **Purpose:** To assess the nutrition knowledge of childcare providers in regards to the implementation of the 2017 CACFP meal pattern. **Methods:** Convenience sampling, where CACFP participants (n = 398) completed a self-reported survey at the annual mandatory trainings across the state of Nebraska, was employed in this study. Descriptive statistics including frequencies, means, standard deviations, independent sample t tests, and chi-square tests were used to determine differences in nutrition knowledge by geographical location, for-profit and nonprofit, and program settings. **Results:** Data obtained from this study indicate that CACFP participants scored low on questions regarding yogurt (30%), juice (35%), breakfast cereal (37%), and whole grain (43%) questions. Data also show that there was no significant difference in levels of

knowledge among characteristics and demographics of programs, types of facilities, and geographic locations. Translation to Health Education Practice: The present study results underscore the importance for continued professional development for CACFP participating childcare providers to implement the new CACFP meal pattern for child nutrition standards.

Background

Nearly 1 in 4 preschool-aged children (2–5 years) is currently overweight or obese.¹ The prevalence of children under the age of 5 who are overweight and obese has seen little change in the United States over the past decade,^{1,2} and according to emerging research, early childhood obesity (by definition, having a body mass index between the 85th and 95th percentiles on the Centers for Disease Control and Prevention growth charts is considered overweight, and above 95th percentile is characterized as obese)¹ is actually on the rise once again.³ This is cause for concern. Young children who are overweight or obese are at a higher risk for maintaining overweight or obesity throughout their lives.⁴ Childhood obesity has been linked to physical, mental, and emotional health problems, including diabetes, coronary heart disease, eating disorders, and low self-esteem.^{4–6} Specifically, children's dietary intake patterns and preferences in early childhood are directly associated with the development of lifelong eating behaviors and are also linked to obesity and, thus, additional health consequences later in life.^{7,8} The current high prevalence of childhood obesity indicates an increased need for early childhood interventions aimed at improving young children's dietary quality.⁹ Interventions focusing on food served in childcare have shown to positively impact children's development of nutrition and healthy eating behaviors and are an emerging area of inquiry for early childhood obesity prevention.^{10–12}

Modern-day health promotion and education programs involve more than a single-layer intervention aimed at a singular outcome. Successful programs include organizational and environmental interventions as well as enacting social changes to impact health concerns across the spectrum. The social-ecological model is a theory-based framework built for understanding the multifaceted and interactive effects of personal and environmental factors involved in health behaviors as well as identifying specific areas for health promotion programming.¹³ The social ecological model includes 5 nested hierarchical levels of influence: individual, interpersonal, community, organizational, and policy/enabling environment.¹³ All of these

levels play an integral part in health promotion and education program development. Early childhood-based health promotion programs provide a unique platform for intervention, because all of the levels of influence (individual, interpersonal, community, organizational and policy/enabling environment) are oftentimes represented in one setting.

About 11 million children in the United States attend some form of organized childcare where they spend on average 33 hours a week and consume up to 3 meals and snacks a day.¹ Childcare providers (individuals who provide direct care to the children attending the childcare center, including licensee, director, teacher, aide, and other individuals who count in the staff-to-child ratio) offer an ideal environment to deliver interventions for improving children's nutrition and preventing early childhood obesity.¹⁴ The U.S. Department of Agriculture's (USDA) Child and Adult Care Food Program (CACFP) is striving to improve the nutritional quality of foods offered to children in childcare settings through policy, systems, and environmental changes. CACFP serves more than 4.2 million U.S. children by providing monetary reimbursement to childcare providers and, in return, childcare providers are required to serve nutritious meals to children in their care.¹⁵ Although the original intent of CACFP was to provide food for children with nutrient deficiencies, today CACFP works to improve diet quality in order to offset chronic health conditions by ensuring that all children have access to nutritious meals that aid in growth and development.¹⁵ CACFP regulates portion size and food components served to children and provides nutrition education, meal planning resources, and professional development opportunities related to diet quality to childcare providers.¹⁵ Participation in CACFP has been shown to improve overall diet quality and may be linked to lower prevalence of overweight and obesity.¹⁶ Due to the amount of time children spend in childcare each week and the number of meals consumed in the early childhood classroom, childcare programs offer an ideal setting for shaping children's dietary intakes. Additionally, research shows that it is of utmost importance that healthy foods are served to children during mealtime in childcare in order to improve early childhood dietary quality and health outcomes.¹⁷⁻¹⁹

Previous research has called for an update to CACFP recommendations in childcare settings;^{10,20} specifically, the need for policies that comply with the Dietary Guidelines for Americans.²¹ Head Start Performance Standards and the Academy of Nutrition and Dietetics have recommended that foods and beverages served to children in childcare should meet at least one half to one third of children's daily needs for energy and development.^{10,20} The Healthy Hunger Free Kids Act of (HHFKA) 2010 required CACFP (as well

as all other child nutrition programs) to update its meal pattern requirements to reflect the latest Dietary Guidelines for Americans.^{15,21} The most recent Dietary Guidelines for Americans focus on helping children develop healthy eating patterns across the life span by emphasizing wider variety, higher nutrient density, moderating portions, limiting calories from added sugars and saturated fats, as well as reducing sodium intake, shifting to healthier food and beverage choices and supporting healthier eating habits for all.^{15,21} As of October 1, 2017, all CACFP-participating childcare providers must adhere to updated menu requirements, including increasing fruit and vegetable availability, increasing whole grains, removing grain-based desserts, and reducing added sugars in breakfast cereals and yogurts.¹⁵ **Table 1** shows the comparison between old and updated CACFP meal pattern for all of the food components and age groups.

A historical barrier to compliance with CACFP regulations was a lack of specificity within the previous meal pattern requirements. Though serving sizes for children over the age of 2 years were clearly indicated, the infants and toddlers age group received more general recommendations for portion sizes that confused childcare providers.²² As indicated in the 2002 Feeding Infants and Toddlers Study, serving sizes did not match across categories in the CACFP recommendations and, consequently, providers often overserved items such as milk, cereal, bread, and fruits and vegetables to the children in their care.²³ Additionally, a study reviewing 38 CACFP-participating childcare centers' lunch meals noted that although all of the centers were providing all required components at lunch for all age groups, not all components made it to the child's plate.²⁴ Specifically, vegetables were the least likely to be served to the children.²⁴ Additionally, data from North Carolina that examined food intake among 117 children enrolled in childcare found that children in childcare underconsume milk, whole grains, and vegetables as indicated by the recommendations in 2008.²⁵ These results are consistent with findings from various other research studies.^{8,26-29} Based on findings from previous research, the updated CACFP recommendations (as of October 1, 2017) now provide more specificity in the meal pattern requirements. What is not known is whether childcare providers show improved knowledge for implementing the new meal pattern requirements.

Although all 50 states are working to provide technical assistance to childcare providers regarding the updated CACFP meal pattern requirements, much is unknown about the current level of knowledge of childcare providers regarding the CACFP updated meal pattern. In order to

Table 1. Comparison between old and updated CACFP meal pattern for all of the food components and age groups.^a

<i>Children and adults</i>		
<i>Meal Component</i>	<i>Old meal pattern</i>	<i>Updated CACFP meal pattern</i>
Grains	<ul style="list-style-type: none"> ▪ Grains must be whole grain, enriched, or fortified 	<ul style="list-style-type: none"> ▪ At least one serving of grains per day must be whole grain-rich ▪ All grains that are not whole grain-rich must be enriched ▪ Grain-based desserts are not creditable ▪ Breakfast cereal must contain no more than 6 g of sugar per dry ounce
Fruits and vegetables	<ul style="list-style-type: none"> ▪ Vegetables and fruit are one combined component ▪ Juice may meet the entire vegetable/fruit component at breakfast, may meet up to one half of the vegetable/fruit component at lunch 	<ul style="list-style-type: none"> ▪ Separate vegetable component and fruit component at lunch, supper, and snack ▪ Juice may fulfill the entire vegetable component or fruit component at only one meal or snack per day
Meats and meat alternatives	<ul style="list-style-type: none"> ▪ No meat/meat alternate component at breakfast 	<ul style="list-style-type: none"> ▪ A meat/meat alternate may be used to meet the entire grains component at breakfast no more than 3 times a week ▪ Tofu and soy yogurt are creditable meat alternatives ▪ Yogurt must contain no more than 23 g of sugar per 6 oz
Milk	<ul style="list-style-type: none"> ▪ Must serve low-fat (1%) or fat-free (skim)milk to children 2 years old and older and adults; may be flavored or unflavored 	<ul style="list-style-type: none"> ▪ Must serve unflavored whole milk to 1-year-old children ▪ Must serve unflavored low-fat (1%) or fat-free (skim) milk to children 2 through 5 years ▪ Must serve unflavored low-fat (1%) fat-free (skim) or flavored fat-free (skim) milk to children 6 years old or older and adults ▪ May serve yogurt in place of milk once per day for adults only
Food preparation	<ul style="list-style-type: none"> ▪ No restrictions on how food is prepared 	<ul style="list-style-type: none"> ▪ Deep fat-fried foods that are prepared on-site are not creditable
Age groups	<ul style="list-style-type: none"> ▪ Four age groups <ul style="list-style-type: none"> 1–2 years old 3–5 years old 6–12 years old Adults 	<ul style="list-style-type: none"> ▪ Five age groups <ul style="list-style-type: none"> 1–2 years old 3–5 years old 6–12 years old 13–18 years old Adults

(continued)

Table 1. Comparison between old and updated CACFP meal pattern for all of the food components and age groups.^a (continued)

<i>Infants</i>		
<i>Meal Component</i>	<i>Previous meal pattern</i>	<i>Updated CACFP meal pattern</i>
Breastfeeding	<ul style="list-style-type: none"> ▪ May claim reimbursement for meals containing expressed breastmilk 	<ul style="list-style-type: none"> ▪ May claim reimbursement for meals containing expressed breastmilk ▪ May claim reimbursement for meals when a mother directly breastfeeds her infant on-site
Vegetables and fruit	<ul style="list-style-type: none"> ▪ Vegetables and/or fruit required at breakfast, lunch, and supper for 8- to 11-month-olds ▪ Juice allowed at snack 	<ul style="list-style-type: none"> ▪ Vegetables and/or fruits required at breakfast, lunch, supper, and snack for infants 6–11 months old as developmentally ready ▪ Juice is not creditable
Meat alternatives	<ul style="list-style-type: none"> ▪ Only egg yolks are creditable ▪ Cheese food and cheese spread are creditable 	<ul style="list-style-type: none"> Whole eggs are creditable Cheese food and cheese spread are not creditable
Grains	May only serve bread or crackers at snack for 8- to 11-month-olds	May serve bread, crackers, or ready-to-eat cereals at snack for infants 6–11 months old, as developmentally ready
Age groups	Three age groups: 0–4 months old 5–7 months old 8–11 months old	Two age groups: 0–5 months old 6–11 months old

a. CACFP indicates Child and Adult Care Food Program.

inform successful implementation of the new updated CACFP meal pattern and thus improve the quality of food served to young children, the present study assessed the knowledge of childcare providers on the updated regulations and requirements as well as nutrition topics to better understand the missing links and barriers that providers face when implementing nutrition policies. Examining childcare providers' nutrition knowledge can guide the future creation of professional development and training for childcare providers for improving the implementation of the new CACFP meal pattern.²⁹ By examining current levels of policy and regulation understanding at the childcare provider level, Health Educators can work to develop targeted in-service programs designed to better train their early childhood educator clientele. Additionally, improved nutrition and regulation knowledge is related to increases in childcare provider self-efficacy to implement the menu regulation requirements.²⁹ Furthermore, childcare providers' nutrition knowledge has been associated

with the implementation of nutrition best practices through improved childcare menus.^{14,16,29,30} When childcare providers' understandings and implementation of program regulations are optimal, environmental and social change within the early childhood education community can take place. When childcare providers' understandings of program regulations are lacking, proper program implementation and desired outcomes will be limited, indicating a missed opportunity to promote the health of young children and prevent obesity.

Purpose

With the release of the updated CACFP meal pattern, states and Health Educators need to determine knowledge gaps in order to develop targeted training materials and resources to aid providers in achieving new regulations. Implementing the updated meal pattern through nutrition in-service professional development of childcare providers is specifically important in Nebraska because Nebraska is ranked fifth for the highest obesity rates in the United States among 2- to 5-year-old children.⁹ Childcare providers' nutrition knowledge may vary based on their childcare context (center based, home based) or location of childcare type and location (urban, rural). In Nebraska, the CACFP is administered by the Nebraska Department of Education (NDE). Nebraska has 2430 childcare providers participating in CACFP (as reported by the NDE). There are 273 childcare centers who participate in the CACFP program in Nebraska. All CACFP participating centers and sponsor organizations are required to attend the annual trainings that are provided by the NDE. The purpose of this study is to assess childcare providers' knowledge regarding the updated CACFP meal pattern. A secondary objective is to determine whether provider knowledge regarding CACFP meal pattern varies by childcare type (center, home) and location (urban, rural).

Methods

Study design and sample

This study utilized a convenience sample, where childcare providers attending one of 11 CACFP trainings were invited to complete a self-reported survey regarding their knowledge prior to implementing the updated CACFP meal pattern. The CACFP Knowledge Survey was distributed

at the Nebraska annual CACFP training, which took place over 11 different dates and locations across Nebraska. These trainings are required by the NDE/Nutrition Services for the childcare providers who participate in the CACFP. The trainings were designed to take 4 hours to provide updated information on the new CACFP meal pattern. Upon registration, the providers were invited to complete the short self-reported survey before the start of the training. This study assessed the nutrition knowledge of childcare directors, providers, and support staff ($n = 389$) who participate in CACFP in Nebraska. In terms of program setting, 97% ($n = 375$) of the participants were center-based childcare providers and 3% ($n = 13$) were home-based childcare providers. CACFP sponsor organizations and support agencies attended the training and were invited to complete the survey ($n = 79$). For the purpose of this article, these responses were omitted from the analysis.

Tool development

The baseline survey contained a total of 35 questions; 27 questions evaluated providers' knowledge in 4 areas: whole grains, milk, meat and meat alternatives, and fruits and vegetables. The survey questions were derived from the Institute of Child Nutrition used in the USDA CACFP new meal pattern trainings, as well as USDA MyPlate, USDA policy memos, and training materials. Questions were selected based on the following criteria: assess changes made to the CACFP meal pattern and assess nutrition knowledge needed to implement changes made to the updated CACFP meal pattern. Specifically, selected questions included regulations regarding the 5 meal components (milk, grains, meats and meat alternatives, fruits, and vegetables), eating occasions (breakfast, lunch/supper, and snacks), age categories (infants, children, adults), serving sizes, food crediting information, and nutrition information necessary to adhere to the updated meal pattern. Demographic questions regarding participants' role in the childcare organization, meals served, and ages served were also included in the survey. Each knowledge question had either 4 response options, one of which was correct, or true-false. Face and content validity were used to validate the survey instrument. In order to establish face validity, the survey questions were first reviewed and edited by nutrition and childcare experts affiliated with the NDE; University of Nebraska- Lincoln/Department of Child, Youth and Family Studies; Nebraska Extension; Gretchen Swanson Center of Nutrition; and Nebraska

CACFP state consultants. Survey reviewers were asked to provide feedback on question content alignment, misleading or unclear questions, missing or unclear response options, repetitive questions or topic areas, and general representation of the subject area in the survey. Specifically, reviewers were asked to revise or delete questions if they were repetitive, unclear, or confusing; focused on best practices and not regulation; and/or not necessary for the implementation of the new meal pattern. Once the expert reviewers provided their feedback, a survey draft was formatted and prepared for pilot testing with childcare providers. Content validity was established by the use of cognitive interviews. Five childcare providers were interviewed to validate the survey's questions (4 center-based providers and 1 home provider). A cognitive interview protocol was followed utilizing "think-aloud" interviewing techniques.³¹ Procedures for the cognitive interviews as outlined in *Cognitive Interviewing: A "How to Guide"* by Gordon B. Willis were followed to ensure consistent and appropriate interviewing techniques.³¹ The purpose of these cognitive interviews was to determine how childcare providers interpret, process, and respond to provided questions and answers. All participating childcare providers were asked to first complete the survey. The amount of time needed to complete the survey was recorded. Following the completion of the survey, the interviewer had the childcare provider review every question. Then, childcare providers were interviewed on every question to determine their understanding and receive feedback regarding readability. Interview prompts were reviewed by a social scientist prior to interview conduction. Time used to complete the survey ranged from 8 to 14 minutes. Participant feedback was used to improve understanding of the answers for the whole grain questions as well as the yogurt and milk crediting questions. Changes to the survey were made based on the childcare provider feedback, and a second round of cognitive interviews was performed to ensure that all edits increased survey readability. Internal consistency was also measured using the Kuder-Richardson formula 20 for the 27-item knowledge scale to be $\alpha = .878$.

Statistical analysis

Descriptive statistical techniques including frequencies, means, and standard deviations were used. Each knowledge-based item was given a code of 0 = incorrect and 1 = correct. Scores were summed to create overall counts of correct data, and the percentage of items answered correctly was

calculated. Data were further stratified by geographical classification (urban, rural), participant role in the childcare facility (director, cook, etc.), ages served, for-profit vs nonprofit status, and program setting (i.e., family childcare in the home versus center-based facility). Independent sample t tests (nonparametric, Mann-Whitney U, when appropriate) were used to indicate statistically significant differences between groups at the .05 alpha level. All analyses were conducted in SPSS Ver 24. ZIP code and site of residence (i.e., rural, urban) data were obtained from the NDE-Team Nutrition and linked to ZIP code data from each participant's unique identifier. Differences in age groups served were only reported in descriptive analysis (i.e., counts and percentage values) and were not statistically compared due to overlap in age groups served. Additionally, knowledge questions were split into categories based on the 4 topic areas (whole grains, fruits and vegetables, meat and meat alternatives, and milk) to generate subscores that could be compared between groups. Finally, chi-square tests were used to measure homogeneity of proportions.

Results

This study assessed the nutrition knowledge of childcare directors, providers, and support staff (n = 389) who participate in CACFP and care for children (n = 38 568) in Nebraska. The survey was distributed during required CACFP training in spring 2017 before implementing the USDA new CACFP meal pattern. Table 2 shows the characteristics and demographic distribution of the study subjects. In terms of program setting, 97% (n = 375) of the participants were center-based childcare providers and only 3% (n = 13) were home-based childcare providers. Additionally, CACFP sponsor organizations and support agencies attended the training and were invited to complete the survey (n = 79). For the purpose of this article, these - responses were omitted from the analysis. Seventy-three percent of the respondents were from urban areas and 27% were from rural areas. The 27-question knowledge survey was developed to assess participants' knowledge related to the USDA/CACFP new meal pattern. Questions were divided into 4 groups, including whole grains, fruits and vegetables, meat and meat alternatives, and milk. Table 3 highlights the participants' responses regarding each question.

Most survey respondents (>95%) answered questions regarding crediting fruits and vegetables, identifying information about the benefits of

Table 2. Characteristics and mean percentages and numbers correct of CACFP providers (N = 389).^a

<i>Characteristics</i>	<i>N (%)</i>	<i>Percent correct (mean ± SD)</i>	<i>Number correct^b (mean ± SD)</i>
Total	389	701.11 ± 13.02	18.93 ± 3.52
<i>Ages served</i>			
Infants	321 (82.5)	70.10 ± 12.75	18.93 ± 3.44
Toddlers	356 (91.5)	70.11 ± 13.02	18.93 ± 3.52
Preschoolers	381 (97.9)	70.16 ± 13.06	18.94 ± 3.53
<i>Geographical classification^c</i>			
Rural	90 (23.1)	70.53 ± 13.59	19.04 ± 3.67
Urban	284 (73.0)	70.34 ± 12.47	18.99 ± 3.37
<i>Participant</i>			
Center/home	307 (78.9)	69.54 ± 13.09	18.78 ± 3.5
Sponsor organization	12 (3.1)	65.74 ± 15.88	17.75 ± 4.29
Other	67 (17.2)	72.91 ± 11.50	19.69 ± 3.11
<i>For-profit vs nonprofit</i>			
Nonprofit	239 (78.7)	70.91 ± 13.67	19.15 ± 3.69
For-profit	141 (36.2)	68.58 ± 12.07	18.52 ± 3.26
<i>Program setting^{d*}</i>			
Family childcare home	13 (3.3)	59.26 ± 14.81	16.00 ± 4.00
Center-based facility	375 (96.4)	70.56 ± 12.76	19.05 ± 3.45

a. CACFP indicates Child and Adult Care Food Program.

b. Out of a maximum score of 27.

c. Category totals do not add up to column total due to missing values.

d. Urban = micropolitan + metropolitan; center/home = director + manager + childcare provider + cook + office assistant; Sponsor = sponsor + other; Other = CACFP support; items had multiple answers and percentages may not total to 100%.

* Significant differences based on $P < .05$.

fruits and vegetable, identifying whole grain foods, identifying the difference between wheat and whole grains, and answering questions about infant consumption of milk correctly (97%, 96%, 95%, 94%, and 95%, respectively). This study also compared the responses between providers who serve children in center-based facilities and providers who serve children in family childcare homes, rural versus urban settings, and nonprofit versus for-profit facilities. The mean of all correct responses was 70%, which is only 19 correct responses out of 27 questions. Overall, participants from center-based facilities scored significantly higher (71%) compared to those from family childcare homes (60%). Additionally, in terms of overall survey scores, there was no significant difference based on geographic location (urban [70.3%] and rural [70.5%] settings) when looked

Table 3. Item-level analysis by geographical classification.^a

<i>Item</i>	<i>Rural N (%)</i>	<i>Urban N (%)</i>	<i>P value</i>	<i>Nonprofit N (%)</i>	<i>For-profit N (%)</i>	<i>P value</i>
Grain Group						
1. Each day, at least _____ serving(s) of grains must be whole grain-rich.	41 (45.6)	123 (43.3)	.70	57 (40.4)	107 (44.8)	.04
2. What is the best way to know that the bread you are buying is a whole-grain bread?	55 (61.1)	183 (64.4)	.56	84 (59.6)	160 (67.0)	.147
3. An example of a whole grain is:	88 (97.8)	267 (94.0)	.15	133 (94.3)	229 (95.8)	.50
4. Which of the following grains are NOT whole grain?	43 (47.8)	125 (44.0)	.53	58 (41.1)	112 (46.9)	.27
5. Which of the following criteria can be used to identify whole grain-rich items?	75 (83.3)	199 (70.1)	.01*	95 (67.4)	180 (75.3)	.09
6. Breakfast cereals cannot contain more than _____ grams of sugar per dry ounce.	29 (32.2)	112 (39.4)	.21	46 (32.6)	98 (41.0)	.10
7. All "wheat" bread is whole grain. True or false?	84 (93.3)	272 (95.8)	.34	136 (96.5)	223 (93.3)	.19
8. Grain-based desserts count toward the grain requirement for meals and snacks served if the first ingredient is "whole grain." True or false?	47 (52.2)	135 (47.5)	.43	58 (41.1)	126 (52.7)	.02*
9. If a childcare program only serves the breakfast meal, the grains don't need to be whole grain-rich. True or false?	80 (88.9)	257 (90.5)	.65	125 (88.7)	215 (90.0)	.68
Fruit and vegetable groups						
10. How many times can a CACFP operator serve 100% fruit juice to children and adults in a single day?	77 (85.6)	240 (84.5)	.80	123 (87.2)	198 (82.9)	.25
11. Which of the following statements is NOT true about juice?	30 (33.3)	100 (35.2)	.74	46 (32.6)	86 (36.0)	.50
12. Vegetables and fruits count as one component for lunch and supper in the updated meal pattern. True or false?	43 (47.8)	164 (57.8)	.09	81 (57.5)	127 (53.1)	.41
13. Which of the following credits toward fruit for a reimbursable CACFP meal?	86 (95.6)	278 (97.9)	.23	139 (98.6)	229 (95.8)	.13
14. Which of the following statements is true about consumption of fruits and vegetables?	86 (95.6)	274 (96.5)	.68	136 (96.5)	228 (95.4)	.62
Meat and meat alternatives group						
15. Which of the following yogurt products are noncreditable?	57 (63.3)	185 (65.1)	.75	85 (60.3)	158 (66.1)	.25
16. Yogurt must contain no more than _____ grams of sugar per _____ ounces.	26 (28.9)	87 (30.6)	.75	40 (28.4)	75 (31.4)	.53
17. Yogurt credits as a fluid milk substitution for children aged 3–5 years old. True or false?	59 (65.6)	202 (71.1)	.31	100 (70.9)	164 (68.6)	.63
18. Tofu and soy yogurt may credit as a meat alternative in meals served to children and adults. True or false?	51 (56.7)	184 (64.8)	.16	82 (58.2)	155 (64.9)	.19
19. Which of the following statements is true about serving beans, peas, and legumes?	82 (91.1)	246 (86.6)	.25	127 (90.1)	203 (84.9)	.15
20. Which of the following statements is true regarding the best practices of serving meat/meat alternatives?	71 (78.9)	228 (80.3)	.77	110 (78.0)	193 (80.8)	.52
21. During the breakfast meal, CACFP operators must serve a meat/meat alternative in place of the entire grain component 5 times per week. True or false?	78 (86.7)	246 (86.6)	.99	123 (87.2)	206 (86.2)	.77

Table 3. (continued)

<i>Item</i>	<i>Rural N (%)</i>	<i>Urban N (%)</i>	<i>P value</i>	<i>Nonprofit N (%)</i>	<i>For-profit N (%)</i>	<i>P value</i>
Milk group						
22. Flavored milk is prohibited for the following age groups, except _____	74 (82.2)	222 (78.2)	.40	102 (72.3)	196 (82.0)	.02*
23. Flavored milk is _____.	78 (86.7)	211 (74.3)	.01*	103 (73.1)	188 (78.7)	.21
24. According to the current CACFP milk requirements, is creditable for 2 years old and older.	53 (58.9)	146 (51.4)	.21	71 (50.4)	130 (54.4)	.44
25. The serving size of low-fat (1%) or fat-free (skim) milk for 3- to 5-year-olds during meals is _____.	58 (64.4)	190 (66.9)	.66	95 (67.4)	157 (65.7)	.72
26. Most 1-year-olds need whole milk to promote healthy growth and development. True or false?	87 (96.7)	268 (94.4)	.38	132 (92.6)	228 (95.4)	.45
27. What type of milk is recommended for infants 12 months and younger?	76 (84.4)	250 (88.0)	.37	124 (85.8)	205 (87.9)	.54

a. CACFP indicates Child and Adult Care Food Program.

* Significant differences based on $P < .05$.

at as a whole. There were differences in scores when compared to food groups (grains, fruits and vegetables, meats and meat alternatives, and milk), program location (rural, urban), and nonprofit and for-profit facilities. Additionally, individual questions yielded significant results when compared to location and setting.

Grains

The grain group included a total of 9 questions. Overall, the mean average for correct answers from the grains group was 4.13 out of 9. Similar results were seen for both rural participants (4.18 out of 9) and urban participants (4.12 out of 9). No participant correctly identified all grain-related regulation questions. All participants scored low on the number of whole-grain items that should be served daily. Only 45.6% of rural participants, 43.3% of urban participants, 40.4% of nonprofit participants, and 44.4% of for-profit participants correctly identified the amount of whole grain-rich items that must be served on the CACFP menu every day. Additionally, CACFP providers scored low on identifying grain products that are not whole grain (47.8% rural, 44% urban, 41.1% nonprofit, and 46.9% for-profit childcare providers). When asked to identify ingredients that are not whole grains, 55% ($n = 159$) of providers often answered with bulgur, brown rice, or quinoa instead of semolina (44%, $n = 174$). Rural participants significantly ($P > .05$) answered the question

in regard to criteria correctly used to identify whole grains (83.3%) compared to urban participants (70.1%). No significant difference was found when comparing nonprofit and for-profit standing. Participants also were unable to correctly identify that they are no longer allowed to serve grain-based desserts. Only 52.2% of rural and 47.5% of urban participants correctly identified the restriction against grain-based desserts. A significant difference ($P > .05$) was seen in nonprofit vs for-profit settings; 41.1% of nonprofit programs correctly identified that grain-based dessert items are no longer creditable compared to 53% of for-profit programs. The question most often answered incorrectly was about sugar limits on ready-to-eat breakfast cereal. When asked about the number of grams of sugar that can be in breakfast cereals, 63% ($n = 222$) answered incorrectly and 33% ($n = 129$) answered 3 g of sugar per dry ounce. Only 32.2% of rural participants and 39.4% of urban participants correctly identified the amount of sugar that can be in ready-to-eat breakfast cereal. Similarly, only 32.6% of nonprofit and 41% of for-profit providers answered this question correctly.

Fruits and vegetables

Overall, scores in the fruit and vegetable group were high. The mean score for all participants was 3.35 out of 5. In regard to fruit or vegetable juice, only 35% of the participants were able to correctly identify that juice is allowed at one meal or snack per day and no longer is a creditable item for infants. Similar results were seen when divided by childcare geographic setting. Only 33.3% of rural, 35.2% of urban, 32.6% of nonprofit, and 36% of for-profit childcare providers correctly identified statements that were not true about juice. Additionally, only 47.8% of rural, 57.8% of urban, 57.5% of nonprofit, and 53.1% of for-profit childcare participants were able to correctly identify that the fruit and vegetable group is now divided into 2 groups.

Meat and meat alternates

Overall, mean group scores for the meat and meat alternatives group were low (3.61 out of 7). All participants, regardless of setting and location, scored low regarding questions on yogurt. Overall, the majority (71%, $n = 242$) of childcare providers misidentified the number of grams of sugar allowed in yogurt. The most frequent answer choice for the amount of sugar

allowed in yogurt was 20 g for every 4 oz of yogurt (51%, n = 197). Only 30% of participants were able to correctly identify the amount of sugar now allowed in yogurt: 28.9% of rural, 30.6% of urban, 28.4% of non-profit, and 31.4% of for-profit participants. Only 56.7% of rural, 64.8% of urban, 70.9% of nonprofit, and 68.6% of for-profit participants correctly identified that tofu and soy yogurts are creditable under the updated CACFP meal pattern. Additionally, low scores were observed for noncredit-able yogurt products. Only 63.3% of rural, 65.1% of urban, 60.3% of non-profit, and 66.1% of for-profit participants correctly identified which yogurt products are not creditable under the updated CACFP meal pattern.

Milk

The overall mean score for correct answers in the milk group was 4.45 out of 6. Only 58.9% of rural, 51.4% of urban, 50.4% of nonprofit, and 54.4% of for-profit participants were able to correctly identify that fat-free (skim), low-fat (1%), lactose-free, and lactose-reduced milk are all creditable under CACFP. Additionally, only 64.4% of rural, 66.9% of urban, 67.4% of nonprofit, and 65.7% of for-profit participants correctly identified the correct milk serving size for children aged 3–5 years. There was a significant difference in the answers regarding flavored milk; 72.3% of nonprofit childcare participants correctly identified that flavored milk can only be served to children over the age of 6 years compared to 82% of for-profit childcare participants. Additionally, rural participants scored significantly higher (86.7%) than urban participants (74.3%) in identifying the nutritional differences between flavored and nonflavored milk.

Discussion

In order to implement evidence-based practices across early childhood contexts, it is imperative that Health Educators clearly understand areas in which childcare providers are lacking in knowledge with regard to regulations and foods served and oftentimes basic nutrition education. Study findings indicate that childcare providers have limited knowledge regarding the new meal pattern requirements. Specifically, Nebraska childcare providers lacked the knowledge related to the amount of sugar in yogurt and breakfast cereal as well as the service of grain-based desserts and flavored milk.

The HHFKA of 2010 requires childcare providers to serve meals and snacks that better align with the Dietary Guidelines for Americans.²¹ Previous studies have found that federal standards are not always met, especially in terms of serving fruit, vegetables, and milk.²⁷ Consistent with the results of the present study, some of these discrepancies in adherence to CACFP federal standards may come from limited knowledge on these standards and indicate the need for more training and education on the importance of the standards.¹⁰ This current study underscores the need for additional focus from Health Educators centered on nutrition education and the updated CACFP meal pattern and highlights areas for delivering targeted training and resources. Professional development for childcare directors and providers has shown benefits in terms of improving their knowledge of CACFP regulations, nutrition standards, physical education practices, and child feeding patterns.^{29,32} Van Stan et al showed a significant improvement in the knowledge level of childcare providers regarding CACFP rule components after participating in targeted nutrition-based in-service focusing on the meal pattern.²⁹ Another study measured whether broad-scale training produced significant improvement in providers' knowledge of nutrition regulations.³² Both of these studies show that improving provider knowledge regarding CACFP meal pattern is a promising avenue to increase implementation of these standards.

Study findings also showed that there was no significant difference in levels of knowledge between characteristics and demographics of programs, types of facilities, and geographic locations. Previous studies have found differences in implementation of nutrition-related best practices across childcare contexts and urban vs rural contexts.³³ These studies have attributed differences to lower access to fresh and affordable foods in rural areas compared to urban areas. Additionally, it has to be noted that childcare centers tend to have high turnover and a knowledge disparity between management and direct care staff compared to family childcare home providers where the owner is usually the provider and responsible for preparing foods for children.³² In Nebraska, homebased childcare providers receive training from CACFP sponsor organizations. Therefore, future education, professional development, and resources should aim at these organizations and the facilities they serve. Though the present study did not find a difference in knowledge across contexts, based on previous studies, professional development and training should account for differences in contexts that may impact implementation of the new meal pattern.

The findings of the present study are supported by earlier research showing that providers may be unaware of evidence-based nutrition information and instead rely on personal knowledge, experience, and common sense when determining nutritional adequacy of foods provided to children, which is often inadequate or incorrect.³⁴ Additional investigation indicates that formal curriculum-based training helps improve provider nutrition knowledge in center-based childcare.³⁵ Utilizing the Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) intervention proved to improve provider nutrition knowledge as well as practices, and policies.³⁵ The results presented in the present study show efficacy for development of evidence-based curriculum to fill the knowledge gaps that we observed in our sample. Additionally, this study further supports the rationale for the need for trainings for childcare provider's directors and foodservice professionals working in early childhood settings.

Based on the results from this study, moving forward, professional development and training should focus on whole grain, yogurt, and sugar requirements as well as milk and meat alternatives. Earlier research supports this strategy, because the efficacy of training to positively impact childcare providers' knowledge of meal pattern regulations and general nutrition best practices has been demonstrated in the past.¹⁶ Professional standards for childcare foodservice professionals (similar to those established for school foodservice professionals) should also be considered.³⁶

This study is not without limitations. One of the limitations of this study is that it utilized a convenience sample. Although the training referenced here is required for CACFP participation, each childcare center is only required to send one attendee, and this person may not be the one who actually prepares the food, creates menus, or completes the grocery shopping. Future studies should sample staff for training to include not only childcare providers who directly care for the children but also cooks or food preparers who make decisions regarding the foods offered to the children. The study sample represents 97% of CACFP-participating center-based childcare providers in Nebraska, which is a strength of the study. Future studies should focus on home-based childcare providers, which were underrepresented in the present study. Furthermore, this study was conducted with Nebraska childcare professionals, so the results should be generalized to other states with caution. Strengths of the study include a large sample size, representation of childcare professionals across the state of Nebraska (a large geographical area), and a

knowledge survey about a timely topic of the updated CACFP meal pattern that is being implemented in CACFP-participating childcare programs across the United States.

Translation to Health Education Practice

The intent of the HHFKA of 2010 was to help improve food served and consumed by children across the country because a majority of children in the United States consume up to 75% of their daily calories in childcare settings. It is of utmost importance that states, Health Educators, and CACFP support agencies work to help childcare providers learn and implement these changes. Food consumption patterns are shaped by a variety of factors at multiple levels of the social-ecological model.²¹ Consistent evidence shows that intervention implementation at multiple levels of the social-ecological model is an effective approach to changing food and nutrition behaviors.²¹ HHFKA of 2010 is not only a policy-level approach to changing the food served in childcare but also a multilevel approach aimed at improving the food environment for children in order to establish lifelong healthy food and nutrition habits. By impacting the food served and environments in which children are exposed to the majority of their eating occasions, Health Educators, state agencies, and early childhood professionals can work together to change the risk factors of young children developing obesity and other chronic diseases later in life. However, implementation of the CACFP new meal pattern can only be accomplished by increasing understanding of the regulations and collaboration of multiple partners to support childcare providers.

It is crucial to note that there has been an enactment of changes in policy and increased support from administration to increase the self-efficacy and implementation of nutrition education by childcare providers and teachers. Finally, more research is needed to evaluate the change in knowledge following professional development and training. Many participants in this study indicated that they were not fully aware of the CACFP changes. Future studies are also needed to understand providers' motivators, facilitators, and barriers levels in regards to serving healthy meal options in childcare facilities. Moreover, studies are needed to assess the differences in the knowledge level of childcare providers who work in facilities where food is prepared on-site vs sites where food is delivered by a catering company.

The present study results underscore the importance of continued efforts from Health Educators focusing on early childhood settings. Policymakers cannot assume that childcare providers can implement policy changes in their facilities without the required working knowledge of nutrition education needed to implement these regulations. Through professional development, training, in-service opportunities, as well as resources for CACFP-participating childcare programs about the updated meal pattern, Health Educators can work to not only increase the knowledge of nutrition regulations and best practices, but impact the early childhood nutrition environment. States, Health Educators, and CACFP support organizations must work together to develop and deliver consistent resources for the childcare providers they serve. Continued efforts should focus on whole grains and yogurt and sugar as well as reviewing the updated CACFP menu requirements. Childcare providers need to be given time to learn the updated regulation and implement the changes without fear of retribution to prevent program dropout. Additionally, state education agencies need to consider professional development and training opportunities that not only teach providers how to implement the updated CACFP meal regulations but focus on menu planning, purchasing, and access to affordable, local ingredients that are creditable by CACFP, culinary skills, and foodservice management. Finally, the level of understanding and implementation needs to be continually tracked and assessed to determine the impact of the changes and the needs for program improvement.

Further, although there has been research focusing on the importance of foodservice professionals in school-based settings,³⁷ there has been limited investigation into the impacts of professional development and training childcare foodservice professionals on the implementation of menu standards. Working with school foodservice professionals was proven to be an excellent opportunity to promote nutrition and healthy eating among children by making healthy food available to children every day and by reinforcing nutrition education that is taught in class.³⁷

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