

NUTRITIONAL QUALITY OF FOODS SERVED IN CHILD CARE SETTINGS

Allison Bouzek, MS, RDN and Alice Jo Rainville, PhD, RD, CHE, SNS, FAND

ABSTRACT

Developing healthy eating habits in childhood may support future healthy food choices. With most children spending some time outside of the home, child care facilities have the opportunity to positively influence children's eating habits. The purpose of this paper is to review recent research regarding foods served in child care settings and determine the nutritional quality of foods served. The Child and Adult Care Food Program (CACFP) is a government program that supports child and adult day care facilities by providing reimbursement for adhering to specific meal and snack nutrition guidelines. Our review found that children in facilities participating in the CACFP are served more nutritious meals than non-CACFP facilities because of the requirement to serve nutrient-dense foods. The literature indicates a need for additional training and education on menu creation and actually serving menued foods, as well as strategies to help children increase their vegetable consumption.

KEY WORDS: Child and Adult Care Food Program, menus in child care facilities, menus in family child care homes, foods in child care settings

INTRODUCTION

In 2016, the National Center for Education Statistics reported that 64% of children aged 3-5 years received at least one week of non-relative care outside of their homes. Child care settings have the opportunity to positively influence these children and their health by serving nutritious foods for proper growth and development (Benjamin-Neelon & Briley, 2011). Some child care facilities are participants in the United States Department of Agriculture's (USDA) Child and Adult Care Food Program (CACFP) which supports child and adult day care facilities by providing reimbursement for adhering to specific meal and snack nutrition guidelines (USDA Food and Nutrition Service [FNS], n.d.). CACFP nutrition guidelines are based on recommendations from the National Academy of Medicine (NAM) (formerly the Institute of Medicine) as they are closely aligned with the Dietary Guidelines for Americans (DGA) (Federal Register, 2016). The purpose of CACFP nutrition guidelines is to increase the consumption of fruits, vegetables, and whole grains, while reducing consumption of saturated fats and added sugars (FNS, 2013).

Table 1. Comparison of CACFP Guidelines (Before and After 2017 Update) as They Pertain to Children in Child Care Settings

	CACFP Before Update	CACFP After Update
Fruits and Vegetables (F/V)	<ul style="list-style-type: none"> • One combined component • At breakfast, F/V juice can meet entire component • At lunch and supper, F/V juice can meet up to ½ of component 	<ul style="list-style-type: none"> • Separate components for lunch, supper, and snack • Juice can fulfill component for either fruit or vegetable at only one meal or snack per day
Grains	<ul style="list-style-type: none"> • Must be fortified, enriched, or whole grain 	<ul style="list-style-type: none"> • At least one serving of grains as whole grains per day • Breakfast cereals must be ≤6 gm per dry ounce • Grain-based desserts are not creditable
Meat/Meat Alternates	<ul style="list-style-type: none"> • No meat/meat alternate component for breakfast 	<ul style="list-style-type: none"> • Meat/meat alternate can be used to meet entire grains component at breakfast (≤3x/wk) • Soy yogurt and tofu are acceptable meat alternates • Yogurt cannot contain >23 gm sugar per 6 oz
Milk	<ul style="list-style-type: none"> • Low-fat (1%) or fat-free (skim) must be served to children ≥2 years old and adults • Can be flavored or unflavored 	<ul style="list-style-type: none"> • Children aged 1 year: unflavored whole milk • Children aged 2-5 years: unflavored low-fat (1%) or unflavored fat-free (skim) • Children aged ≥6 years: unflavored low-fat (1%), unflavored fat-free (skim, or flavored fat-free (skim)
Fried Foods	<ul style="list-style-type: none"> • No restrictions on food preparation 	<ul style="list-style-type: none"> • Deep fat-fried foods prepared on-site are not creditable
Water	<ul style="list-style-type: none"> • Water must be available upon request throughout the day 	<ul style="list-style-type: none"> • Water must be available <i>and offered</i> upon request throughout the day
Meal Service	<ul style="list-style-type: none"> • No recommendation 	<ul style="list-style-type: none"> • Family-style meal practices recommended
Additional Revisions	<ul style="list-style-type: none"> • Child care centers cannot utilize offer vs serve 	<ul style="list-style-type: none"> • Offer vs serve extended to at-risk afterschool sites

Note: From National CACFP Sponsors Association. (2019). *Questions and Answers on the Updated Meal Pattern Requirements for the CACFP*. Retrieved from <https://www.cacfp.org/regulations-legislation-advocacy/regulations-guidance/#Vegetable>.

In April 2016, the USDA updated the CACFP guidelines with the first major development since program commencement in 1968. By October 1, 2017, all participating CACFP facilities were required to adhere to updated meal patterns, as listed in **Table 1**, above. The updated CACFP guidelines remain consistent with the 2015-2020 DGA in that Americans should consume a variety of nutrient-dense foods rich in fruits, vegetables, protein, dairy, grains, and oils, while limiting saturated and trans fats, sodium, and added sugars (Dietary Guidelines.gov, 2015). Not all child care facilities participate in the CACFP due to challenges and barriers adhering to program guidelines. Findings by Bandy, Peterson, Wilkerson, Hedge, and Stage (2019) suggest that such challenges and barriers for child care facilities not providing healthier meals, include: (1) low budgets to spend on healthier and greater variety of foods; (2) lack of knowledge and time to prepare healthier foods; and (3) children disliking healthier foods served. CACFP participants are required to create menus that accurately reflect the CACFP guidelines while also serving foods as listed on menus. Adhering to the CACFP guidelines ensures that reimbursement is properly distributed among CACFP-participating facilities. Menu inaccuracies could lead to missed opportunities for nutrition education, meal planning assistance, lost benefits from additional health programs, and inadequate nutrition for the children.

It is required that participating CACFP facilities adhere to CACFP nutrition guidelines; however, the extent to which menued foods are actually served and consumed in participating CACFP facilities is not known. The purpose of this paper is to review research regarding foods served in both CACFP and non-CACFP child care settings to determine the nutritional quality of foods served and the extent to which CACFP guidelines are followed in participating programs.

METHODS

A search for peer-reviewed articles published between the years 2014 to 2019 was conducted using PubMed and Web of Science databases. Inclusion criteria were U.S. studies that focused on child care facilities where CACFP participation was noted (i.e. CACFP or non-CACFP) and involved participants aged 1 to 6 years. There were no exclusion criteria for timeframe regarding the CACFP guideline changes as the studies analyzed included data collection that occurred both before and after the CACFP updates in 2017. An overview of the included studies is presented in **Table 2**.

Table 2. Description of Studies Evaluating Effect of CACFP Guidelines on Nutrition and Menu Adherence

Author (Year)	CACFP Meal Pattern ^a	Environment ^b	Participation	Sample	Participants	Design	Data Collection	Results
Andreyeva et al. (2018)	B (June 2015-July 2016)	CCC	53 CACFP 44 non-CACFP	Preschool-aged children	n = 838 children (468 CACFP and 370 non-CACFP)	•Dietary quality of lunches	Observation and plate waste of served and consumed lunches	<ul style="list-style-type: none"> •Children in CACFP centers consumed more low-fat (1%) milk and less trans fats and saturated fats than children in non-CACFP centers •All children consumed below CACFP requirements and NAM recommendations of both dietary fiber (5.5 gm) and calories (mean kcal below 338 kcal NAM recommendation)
Benjamin-Neelon et al. (2018)	B (2013-2016)	FCCH	151 CACFP 15 non-CACFP	Aged 18 months-4 years old	n = 496 children	•Determine associations b/w nutrition environment quality and children's diet quality	<ul style="list-style-type: none"> •Observers recorded all meals and snacks served and consumed for 2 days and estimated amount of food/beverage (F/B) served, wasted, exchanged, and remaining •Dietary Observation for Child Care (DOCC), modified Environment and Policy Assessment and Observation (EPAO), and HEI-2010 	<ul style="list-style-type: none"> •Better nutrition environments associated with higher diet quality in children •Mean EPAO nutrition score of 9.1 •Mean HEI-2010 score of 58.9 •Greater HEI-2010 score in children associated with higher EPAO nutrition score, nutrition education, and nutrition policy
Breck et al. (2016)	B (April 2010-June 2010)	CCC	69 CACFP 26 non-CACFP	Aged 3-4 years old	Unknown	•Evaluation of whether F/B listed on menus matched what was served	<ul style="list-style-type: none"> •Direct observation using Mealtime Observation Form •Foods coded as: (1) matching menu item 'match'; (2) acceptable substitute 'substitution'; (3) on menu but not served 'omission'; and (4) served but not on menu 'addition' 	<ul style="list-style-type: none"> •Menus were fairly accurate with 87% of F/B served were listed on menus or allowed as substitution •14% F/B served were substitutions •13% F/B served were additions •12% F/B served were omissions
Erinosho (2018)	B (Fall 2015-Spring 2016)	FCCH	56 CACFP 77 non-CACFP	Aged 3-5 years old	Unknown	•Assessed F/B served at lunch and presence/absence of nutrition practices and policies to determine differences based on CACFP participation	FCCH providers completed a modified EPAO-self report (EPAO-SR) tool	<ul style="list-style-type: none"> •>75% of FCCH provided components from fruit, vegetable, grain/bread, meat/meat alternate, and milk food groups •82% served vegetables •Bread served in 67% of FCCH (white at 37%, wheat at 30%, and 100% whole wheat at 28%) and grains served in 31% FCCH •86% served meats and 15% served meat alternates •90% served milk (skim/1% milk at 48%, 2% milk at 37%, and whole at milk 15%) •60% served water, 33% served 100% juice, and 10% served fruit drinks •5% served dessert •62% CACFP homes served lower-fat milk vs 45% non-CACFP homes •0% CACFP homes served fruit drinks vs 17% non-CACFP homes •CACFP homes ($P < .05$) reported serving healthier beverages, and having healthier nutrition practices and more written nutrition policies than non-CACFP homes •88% of CACFP reported having written nutrition policies vs 29% non-CACFP

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Author (Year)	CACFP Meal Pattern ^a	Environment ^b	Participation	Sample	Participants	Design	Data Collection	Results
Frampton et al. (2014)	B	CCC	63 CACFP 20 non-CACFP	Aged 2-5 years old	Unknown	Macro/micronutrient content of menus analyzed for 5 lunches and compared to 1/3 of DRIs for children aged 1-3 years old and children aged 4-8 years old	CCC directors completed a seven-question telephone survey	<ul style="list-style-type: none"> •Menus provide adequate protein, vitamins A & C, zinc, and magnesium •Menus provide insufficient carbohydrate, dietary fiber, vitamins D & E, and iron •Sodium provided >50% DRI for both age groups •Menus provided <20% 1-3 year olds' DRI and for dietary fiber and vitamins D & E, and provided <20% 4-8 year old's DRI for iron, dietary fiber, and vitamins D & E •Menus provided 31% of 4-8 year olds' DRI for calcium and folate •Calcium was significantly higher than 1/3 of DRI for 1-3 year olds, but lower than 1/3 for 4-8 year olds
Rasbold et al. (2016)	B (2011-2014)	CCC	25 CCC (CACFP participation not noted in study)	Aged 3-5 years old	n = 415 children	Analyze energy, macronutrients, and micronutrients in foods served at 2 lunches and compare them with DRIs for both 1-3 year olds and 4-8 year olds	DOCC form to assess F/B served and consumed at lunch	<ul style="list-style-type: none"> •Consumed protein was 2x the recommendation of DRI for both age groups, while carbohydrate and energy were consumed inadequately •On average, DRIs were met for both age groups for served energy and total fat •DRIs were exceeded by both age groups for served protein and carbohydrate •Total fat consumption met DRIs for both age groups •On average, energy consumption was significantly lower than 1/3 DRI for both age groups (88-221 kcal too few) •Carbohydrate consumption was inadequate for both age groups (by 6 gm) •Protein consumption was significantly higher for both age groups (by 10-12 gm) •Micronutrients served for both age groups exceeded zinc, magnesium, folate, and vitamin A; vitamin E was inadequate; and iron was exceeded in only 1-3 year olds •Micronutrients consumed met folate needs for both age groups, but calcium and zinc were exceeded for 1-3 year olds while being inadequate for 4-8 year olds •Micronutrients consumed for both age groups exceeded manganese and vitamin A while being inadequate in iron and vitamin E
Schermbeck et al. (2019)	B (August 2017-September 2017)	ECEC ^c	1,343 CACFP	Aged 2-5 years old	Unknown	Analysis of provision of sugary cereals before updated CACFP guidelines	Center directors completed a we-based survey	<ul style="list-style-type: none"> •30.1% of centers did not meet updated CACFP requirement for cereal served •Centers not meeting updated CACFP requirements: 53.5% served sugary cereals <1x per week and 5.8% served sugary cereal >1x per week

Table 2. Description of Studies Evaluating Effect of CACFP Guidelines on Nutrition and Menu Adherence

Author (Year)	CACFP Meal Pattern ^a	Environment ^b	Participation	Sample	Participants	Design	Data Collection	Results
Schwartz et al. (2015)	B	CCC	38 CACFP	Preschool-aged children (aged 2.5-5.7 years old)	n = 204 children	Assessment of nutritional quality of lunches and compilation with CACFP guidelines, the 2011 IOM recommendations, and the USDA's 2015 Proposed Rule	Trained researchers completed direct observation via visual estimates during lunch of foods served and consumed	<ul style="list-style-type: none"> •CCC generally comply with CACFP guidelines but are not consistent with 2011 IOM recommendations for protein, fiber, saturated fat, and sodium •Milk was served at approximately 2/3 cup and consumed at an average of 1/2 cup •Meat and cheese served exceeded CACFP guidelines and more than doubled IOM recommendations •Lean meat/meat alternates were not commonly served with regular ground beef being the most frequently served meat •Children more likely to consume produce if both a fruit and a vegetable are served vs offering only one fruit or one vegetable •Grains were consumed at more than the CACFP requirement
Tovar et al. (2018)	B (2013-2016)	FCCH	151 CACFP 15 non-CACFP	Aged 18 months-4 years old	n = 495 children	Analysis of foods served and consumed, and comparison to 2010 DGA, CACFP, and HEI-2010	<ul style="list-style-type: none"> •DOCC to record meals and snacks for 2 days •Observers recorded all meals and snacks served and consumed and estimated amount of F/B served, added, wasted, exchanged, and remaining 	<ul style="list-style-type: none"> •Children consumed 61-80% of foods served •HEI-2010 standards were: (1) close to met for fruit and dairy; (2) not met for seafood and plant proteins, beans, vegetables, whole grains, and fatty acids; and (3) exceeded for refined grains and sodium •HEI-2010 food served was 63.6 and 61.7 for food consumed •Foods served and consumed did not meet HEI-2010 guidelines
Dave & Cullen (2018)	A (Feb 2016-May 2016)	ECEC	9 CACFP (4 day care and 5 Head Start)	Aged 3-5 years old	Mean of 52 children at day care centers and mean of 99 children at Head Start Centers	<ul style="list-style-type: none"> •Analysis of breakfast, lunch, and snack for matches, additions, omissions, and substitutions •Calculations for each food component in CACFP guidelines and compared to updated CACFP guidelines 	<ul style="list-style-type: none"> •On-site anonymous observation and menu coding for breakfast, lunch, and snack for matches, additions, omissions, and substitutions calculated for each food component •All food components classified as fully met, partially met, or not met 	<ul style="list-style-type: none"> •94-100% match between foods served and posted menus when acceptable substitutions were included •Fully met: serving only unflavored low-fat or 1% milk •Partially met: serving greater variety of fruits and vegetables, limiting pre-fried foods to <1 serving/week, avoiding added sugars •Not met: serving 1 whole grain serving/day, lower-fat meat and meat alternates, limiting processed meats to <1 serving/week, and low-fat or reduced-fat cheeses •Breakfast: 59.6% menu match to foods served and updated CACFP guidelines were met 100% of the time •Lunch: 95.5% menu match to foods served and updated CACFP guidelines were met for all foods except fruit (95.2%) •Snacks: 75.7% menu match to foods served and updated CACFP guidelines were met 93.9% of the time •No unacceptable substitutions served •Centers met old CACFP guidelines, but menu improvements needed to meet updated CACFP guidelines

^a Data collection indicated as either before (B) or after (A) updated the CACFP guidelines.

^b Environment classified as child care center (CCC) or family child care home (FCCH).

^c ECEC indicates Early Care Education Center that includes day care centers and Head Start centers.

RESULTS

CACFP Participation and Effect on Foods Served

The CACFP assists participating facilities in providing nutritious meals and snacks to more than 4.2 million children and 130,000 adults every day, averaging 2.1 billion meals served per year (USDA Economic Research Service, 2017). In accordance with updated CACFP guidelines, meals and snacks must now include up to five components: fruits, vegetables, grains, meat and meat alternates, and fluid milk (USDA, n.d.). The breakfast meal must include three components (fruits/vegetables, grains, and fluid milk), lunch and supper meals must include all five components, and snacks must include two of the five components. Meal component serving sizes are based on age group; in CACFP child care settings, age groups are divided into ages 1-2 and ages 3-5 (USDA, n.d.).

Although the CACFP provides nutrition guidelines, it does not limit low-nutrient foods or high-calorie beverages that could cause adverse health effects such as vitamin and mineral deficiencies, obesity, or heart disease. Some studies have analyzed the specific foods served in child care settings and the impact of CACFP participation on foods served. Andreyeva, Kenney, O'Connell, Sun, and Henderson (2018) compared the nutritional quality of foods served and consumed at lunch in 53 CACFP and 44 non-CACFP child care centers (CCC) in Connecticut prior to the updated CACFP guidelines. There were significant differences between CACFP and non-CACFP centers, with only 68% of non-CACFP centers serving all required meal components. CACFP status showed no difference in average food component consumption. Children in CACFP centers consumed more milk than children in non-CACFP centers, resulting in higher calcium consumption. Overall, children in CACFP centers consumed less total fat, trans-fat, and saturated fat that promote adequate growth. CACFP and non-CACFP centers exceeded serving recommendations for sodium, increasing risk of heart disease. Study results also showed that CACFP status was only a predictor of low-fat milk consumption and no other meal components.

Similarly, Erinoshio et al. (2018) conducted a study that analyzed data from 133 family child care homes (FCCH) (56 CACFP homes and 77 non-CACFP homes) in Mississippi prior to the updated CACFP guidelines. The greatest difference found between CACFP homes and non-CACFP homes was type of beverages served. Milk (skim and 1% fat) was served in 62% of CACFP homes and in only 45% of non-CACFP homes. Fruit drinks were not served at all in CACFP homes, but were served in 17% of non-CACFP homes. This study concluded that CACFP participation was positively associated with the nutritional quality of beverages served in FCCH.

Foods Served versus Foods Consumed

Children may be served a wide variety of nutritious foods in child care, but the health benefits are not realized if the food is not consumed. A study of 166 FCCH (151 CACFP homes and 15 non-CACFP homes) in North Carolina used diet observation, prior to introduction of new CACFP guidelines, to determine the nutritional quality of foods served, as well as the amount of food consumed, by children aged 18 months to 4 years (Tovar et al., 2018). The Healthy Eating Index (HEI-2010) was used to determine nutritional quality in terms of compliance with the 2010 DGA by scoring 12 components: nine components on food nutrient adequacy and three components on food moderation (National Collaborative on Childhood Obesity Research, n.d.). Tovar et al. (2018) found that dietary standards were not met in any FCCHs for quality of food served or consumed. HEI-2010 food quality standards were almost met for fruit, dairy, and empty calories; but whole grains, vegetables, fatty acids, greens and beans, seafood, and plant proteins were well below HEI-2010 standards, suggesting that essential sources of vitamins,

minerals, and fiber were not adequately provided. On average, all children consumed 73.8% of the foods served, with vegetables representing the lowest consumption of portions served (61%) and whole fruit representing the highest consumption (79.7%). No differences in food consumption between CACFP and non-CACFP participation were noted in the study.

Similar studies have been conducted in CCC serving toddlers and pre-school age children comparing foods served and foods consumed to various dietary standards (Dietary Reference Intakes (DRI), IOM 2011 recommendations, and the USDA 2015 Proposed Rule) and demonstrating shortcomings in the provision of adequate micronutrients. Rasbold et al. (2016) used the Dietary Observation for Child Care (DOCC) form to assess foods served and consumed at lunch in 25 Oklahoma CCC (CACFP participation not stated) for children (n = 415) aged 3-5 years. For food served, DRIs were met or exceeded for energy, total fat, served protein, carbohydrates, and specific micronutrients (zinc, magnesium, folate, and vitamin A). Vitamin E servings were below DRI. Iron servings were adequate for children aged 3 years, but below DRI for children aged 4-5 years. Consumption of protein exceeded DRI for all age groups, but energy and carbohydrate consumption were below DRI. DRIs for children aged 1-3 years also exceeded standards for zinc, while children aged 4-8 consumed inadequate amounts of zinc.

Prior to the CACFP guideline update, trained researchers used direct observation via visual estimates of foods served and consumed in 38 CACFP participating CCC for children (n = 204) aged 2.5-5.7 years (Schwartz et al., 2015). When comparing the CACFP guidelines, 2011 IOM recommendations, and the USDA's 2015 Proposed Rule, they found that the CCC generally complied with CACFP guidelines for foods served, but were not consistent with the 2011 IOM recommendations for protein, fiber, sodium, and saturated fat. Consumption analyses showed energy, phosphorus, magnesium, zinc, and vitamins A and B12 to be adequate; dietary fiber, iron, folate, potassium, and vitamins B6, C, and E to be inadequate; and protein, sodium, and saturated fat to be excessive. Schwartz et al. (2015) also found that children were more likely to consume both a fruit and a vegetable when the components were served together compared to when only one component was served. Study results showed that updated CACFP guidelines could promote better fruit and vegetable consumption for children in participating CACFP facilities due to the updated guidelines requiring both fruits and vegetables to be served.

Diet Quality

Child care facilities that serve a variety of nutrient-dense foods can help promote proper growth and development in children. Some children in child care facilities do not have access to or receive nutritious foods at home and thus, can further benefit from CACFP participation and proper use of CACFP guidelines. Prior to the CACFP guideline update, Frampton et al. (2014) had 83 CCC (63 CACFP and 20 non-CACFP) directors complete a telephone survey to determine the macro- and micronutrient content of lunch menus in comparison to DRI standards. The study found that menus were providing adequate amounts of protein, vitamins A and C, magnesium, and zinc, but insufficient amounts of carbohydrate, dietary fiber, iron, and vitamins D and E. Additionally, sodium provided more than 50% of the recommended DRI. The study concluded that menus in some child care facilities lacked important macro- and micronutrients and included excessive sodium.

Cereals can be a healthy choice and a quick snack for preschoolers, but may contain a lot of sugar. Effective in October 2017, CACFP guidelines updated sugar content of cereals to limit consumption to less than 6 grams per dry ounce (Federal Register, 2016). Schermbeck, Leider, and Chriqui (2019) surveyed 1,343 CACFP-participating CCC in 47 states to determine how many CCC serve sugary cereals and frequency of service. Most CCC (69.9%) reported that their facilities met the updated CACFP requirements, with only 5.8% of CCC indicating that sugary cereals were served more than once per week and 53.5% serving these foods less than once per

week. This data shows that most CACFP CCCs report meeting the updated CACFP guidelines, but perhaps additional nutrition education for staff would be beneficial for the facilities to fully meet the updated guidelines and provide children with nutrient-dense breakfasts.

Diet Quality: Nutrition Practices and Nutrition Policies

The Environment and Policy Assessment and Observation (EPAO) is an observation tool used to evaluate practices, policies, and nutrition and physical activity environment in CCC – with a modified (self-reported) version available for use in FCCH (The University of North Carolina at Chapel Hill, 2018). Erinoshio et al. (2018) used the modified EPAO to assess foods served at lunch in 133 FCCH in Mississippi (56 CACFP and 77 non-CACFP) and analyzed the presence/absence of nutrition practices and policies based on CACFP participation. The study found that regardless of CACFP participation, most FCCH were meeting CACFP guidelines. However, CACFP FCCH reported serving healthier beverages (lower-fat milk [skim and 1%] and no fruit drinks) than non-CACFP participants. Providers at CACFP FCCH also reported having healthier nutrition practices and more written nutrition policies than non-CACFP FCCH. Study results indicate the need for nutrition standards and non-CACFP FCCH-provider training to promote and increase healthful nutrition practices and nutrition policy development.

Benjamin-Neelon et al. (2018) used the modified EPAO and HEI-2010 to assess foods consumed and the nutrition environment in 166 FCCH in North Carolina (151 CACFP homes and 15 non-CACFP homes). EPAO data was collected and HEI-2010 score was calculated after two days of in-person observation by trained data collectors. Results showed improved diet quality in children (n = 496) was associated with higher nutrition-related education scores for the children and their parents as well as professional development training of the child care staff. Additionally, the children had higher overall HEI-2010 scores with higher sub-scores for items related to nutrition education, foods served, and nutrition policy. Study results show that the diet quality of children may be linked to the use of nutrition policies in FCCH.

Do Menus Match Foods Served?

Efforts to improve nutritional quality of foods for children in child care settings are ongoing with an important aspect – the extent to which menus match the foods that are served. Breck, Dixon, and Khan (2016) analyzed menus from 95 CCC (69 CACFP and 26 non-CACFP) and found that 87% of the listed menu items matched foods served. Yogurt and cheese items were listed on the menu, but not served 23% of the time. Desserts and fruit juice were served 43% and 25% of the time, respectively, when not listed on menus. Additionally, water was not served 71% of the time it was listed on menus. Study results suggest that although menus in CCC represented almost 90% of the foods served, menu inaccuracies pose the need for nutrition education, meal planning assistance, and proper communication with parents about their child's food consumption.

The 2017 updated CACFP guidelines require a greater variety of fruits and vegetables, more whole grains, and a reduction of solid fats and added sugars served in meals (Federal Register, 2016). Dave and Cullen (2018) collected data after the CACFP guideline update and found that in 9 CACFP-participating Early Child Education Centers (ECEC), 94-100% of lunch menus matched the foods served when acceptable menu substitutions were considered. Additionally, vegetables, grains, protein, and milk offerings were found to match lunch menus 100% of the time, while fruit matched more than 95% of the time. Due to the recent updates to CACFP guidelines, with few studies having data collection occurring after the CACFP update, future research is needed to determine if menus in child care settings meet the new CACFP requirements and match foods that are actually served.

CONCLUSION

Research published in the last five years indicates that in general, children in childcare facilities participating in the CACFP are served more nutritious meals than non-CACFP facilities. Foods served in CACFP child care settings met or exceeded macronutrient requirements and most micronutrient requirements, as reported in selected studies. Menus matched most of the foods served in the reviewed studies, although water was not always served when listed. Generally, FCCH serve healthy foods that met most CACFP requirements, but increases in the serving of whole grains, vegetables, seafood, and plant proteins to ensure children are being exposed to essential nutrients for proper growth and development was recommended.

These findings may suggest a need for menu improvements to address potential nutrient inadequacies in foods served. This is important because past research has shown that when foods served meet CACFP guidelines, children have an increased probability of consuming adequate amounts of required nutrients. Child care facilities should continue to serve a variety of nutrient-dense foods and not focus on particular nutrients as that could lead to complete exclusion of some other nutrients, causing nutrient deficiencies and negatively affecting growth and development.

Finally, our review of the selected studies suggested a need for additional training and education for child care providers. The research suggests that training and education could focus on menu creation that correctly follows the updated CACFP guidelines and serving menu items as listed. Additionally, trainings that focus on strategies to help children increase their vegetable and milk consumption could be developed. With the exception of one of the selected studies, all research showed that the CACFP has promoted healthy food options that provide essential macro- and micronutrients. Incorporating nutrient-dense foods, ensuring actual menued foods are served, and increasing caregiver education will help the CACFP to achieve its goal of providing nutritious meals that are safely prepared and promote the health of children in child care centers.

REFERENCES

- Andreyeva, T., Kenney, E. L., O'Connell, M., Sun, X., Henderson, K. E. (2018). Predictors of nutrition quality in early child education settings in Connecticut. *Journal of Nutrition Education and Behavior*, 50(5), 458-467. doi:10.1016/j.jneb.2017.12.016.
- Bandy, K. M., Peterson, A. D., Wilkerson, K., Hedge, A. V., Stage, V. C. (2019). Exploration of mealtime practices and policies among North Carolina Head Start organizations: Does practice reflect policy? *Journal of Child Nutrition & Management*, 43(1). Retrieved from http://schoolnutrition.org/uploadedFiles/5_News_and_Publications/4_The_Journal_of_Child_Nutrition_and_Management/Spring_2019/Exploration-of-Meal-Time-Practices-and-Policies-Spring2019.pdf
- Benjamin-Neelon, S. E., Vaughn, A. E., Tovar, A., Østbye, T., Mazzucca, S., Ward, D. S. (2018). The family child care home environment and children's diet quality. *Appetite*, 126, 108-113. doi:10.1016/j.appet.2018.03.024.
- Benjamin-Neelon, S. E. & Briley, M. E. (2011). Position of the American Dietetic Association: Benchmarks for nutrition in child care. *Journal of the American Dietetic Association*, 111(4), 607-615. doi:10.1016/j.jada.2011.02.016.
- Breck, A., Dixon, L. B., & Khan, L. K. (2016). Comparison of planned menus and centre characteristics with foods and beverages served in New York City child-care centres. *Public Health Nutrition*, 19(15), 2752-2759. doi:10.1017/S1368980016000720.

- Dave, J. M., & Cullen, K. W. (2018). Foods served in child care facilities participating in the child and adult care food program: Menu match and agreement with the new meal patterns and best practices. *Journal of Nutrition Education and Behavior*, 50(6), 582-588. doi:10.1016/j.jneb.2018.01.010.
- Dietary Guidelines.gov. (2015). *Dietary Guidelines for Americans 2015-2020: Eighth Edition*. Retrieved from https://health.gov/dietaryguidelines/2015/resources/2015-2020_Dietary_Guidelines.pdf.
- Erinosho, T., Vaughn, A., Hales, D., Mazzucca, S., Gizlice, Z., Ward, D. (2018). Participation in the Child and Adult Care Food Program is associated with healthier nutrition environments at family child care homes in Mississippi. *Journal of Nutrition Education and Behavior*, 50(5), 441-450. doi:10.1016/j.jneb.2017.11.004.
- Federal Register. (2016). *Child and Adult Care Food Program: Meal Pattern Revisions Related to the Healthy, Hunger-Free Kids Act of 2010*. Retrieved from <https://www.federalregister.gov/documents/2016/04/25/2016-09412/child-and-adult-care-food-program-meal-pattern-revisions-related-to-the-healthy-hunger-free-kids-act>.
- Food and Nutrition Service. (2013). *Nutrition Standards for CACFP Meals and Snacks*. Retrieved from <https://www.fns.usda.gov/cacfp/meals-and-snacks>.
- Food and Nutrition Service. (n.d.). *Child and Adult Care Food Program*. Retrieved from <https://www.fns.usda.gov/cacfp/child-and-adult-care-food-program>. Frampton, A. M., Sisson, S. B., Horm, D., Campbell, J. E., Lora, K., Ladner, J. L. (2014). What's for lunch? An analysis of lunch menus in 83 urban and rural Oklahoma child-care centers providing all-day care to preschool children. *Journal of the Academy of Nutrition and Dietetics*, 114(9), 1367-1374. doi:10.1016/j.jand.2013.09.025.
- National CACFP Sponsors Association. (2019). *Questions and Answers on the Updated Meal Pattern Requirements for the CACFP*. Retrieved from <https://www.cacfp.org/regulations-legislation-advocacy/regulations-guidance/#Vegetable>.
- National Center for Education Statistics. (2016). *National Household Education Surveys Program (NHES)*. Retrieved from https://nces.ed.gov/nhes/tables/nonrelative_care_2016.asp.
- National Collaborative on Childhood Obesity Research. (n.d.). *The Healthy Eating Index 2010 (HEI-2010)*. Retrieved from https://www.nccor.org/downloads/NCCOR_HEI-factsheet_v8.pdf.
- Rasbold, A. H., Adamiec, R., Anderson, M. P., Campbell, J. E., Horm, D. M., Sitton, L. K., Sisson, S. B. (2016). Macronutrient and micronutrient intakes of children in Oklahoma child-care centres, USA. *Public Health Nutrition*, 19(8), 1498-1505. doi:10.1017/S1368980015002372.
- Schermbeck, R. M., Leider, J., Chriqui, J. F. (2019). Sugary cereals at early childhood education centers participating in the child and adult care food program, 2017. *Preventing Chronic Disease*, 16, E34. doi:10.5888/pcd16.180543.
- Schwartz, M. B., Henderson, K. E., Grode, G., Hyary, M., Kenney, E. L., O'Connell, M., Middleton, A. E. (2015). Comparing current practice to recommendations for the child and adult care food program. *Childhood Obesity*, 11(5), 491-508. doi:10.1089/chi.2015.0041.

- The University of North Carolina at Chapel Hill. (2018). *Environment and Policy Assessment and Observation (EPAO)*. Retrieved from <http://chwr.web.unc.edu/resources/>.
- Tovar, A., Benjamin-Neelon, S. E., Vaughn, A. E., Tsai, M., Burney, R., Østbye, T., Ward, D. S. (2018). Nutritional quality of meals and snacks served and consumed in family child care. *Journal of the Academy of Nutrition and Dietetics*, 118(12), 2280-2286. doi:10.1016/j.jand.2018.08.154.
- United States Department of Agriculture: Economic Research Service. (2017). *The Food Assistance Landscape: FY 2016 Annual Report*. Retrieved from <https://www.ers.usda.gov/webdocs/publications/82994/eib-169.pdf?v=42823>.
- United States Department of Agriculture. (n.d.). *Child Meal Pattern*. Retrieved from https://fns-prod.azureedge.net/sites/default/files/cacfp/CACFP_childmealpattern.pdf.

BIOGRAPHY

Allison Bouzek, MS, RDN lives in Avon, Indiana. Alice Jo Rainville, PhD, RD, CHE, SNS, FAND is Professor of Nutrition and Dietetics in the School of Health Sciences at Eastern Michigan University in Ypsilanti, Michigan.

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