

IMPACT OF CACFP PARTICIPATION AND QUALITY
RATINGS OF CHILD CARE CENTERS ON DIETARY
QUALITY

By

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IMPACT OF CACFP PARTICIPATION AND
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Title of Study: IMPACT OF CACFP PARTICIPATION AND QUALITY RATINGS OF
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Abstract: Introduction/Review of Literature: The average Healthy Eating Index-2015 (HEI-2015) score for children aged 2-17 years is 53.9/100, indicating that children's diets do not align with federal dietary recommendations. Dietary quality (DQ) impacts nearly all aspects of life, including overall health, development of disease-related risk factors, academic performance, and more. The nutrition provided to children needs to be improved to reap the benefits of DQ. Improving nutrition within child care centers may offer a solution. This study examined the average DQ of posted lunch menus served at Oklahoma child care centers. **Methodology:** This study involved a cross-sectional content analysis of 10-day/2-week posted lunch menus from Oklahoma child care centers and a 10-day/2-week best practice (BP) lunch menu. Posted menus were obtained through snowball sampling, and the BP menu was created to achieve the highest possible HEI scores while also being feasible to implement and serve. Nutrient content was assessed using nutrient analysis software and DQ using the HEI-2015. **Findings:** The obtained menus represented 12 Child and Adult Care Food Program (CACFP)-participating, 8 non-CACFP-participating, 9 Three Star rated, and 11 non-Three Star rated child care centers, as assessed by the quality rating improvement system (QRIS) in Oklahoma, Reaching for the Stars. The BP lunch menu scored 18.3 points (29.25%) higher in total HEI score and higher within all HEI components, compared to the posted lunch menus, with differences in whole grains and total score. No differences were found between the HEI scores of posted lunch menus served at CACFP-participating and non-CACFP-participating nor between Three Star rated and non-Three Star rated child care centers. **Conclusion:** This study shows that CACFP participation and quality ratings of child care centers do not impact DQ, revealing areas for improvement within policy and organizations. Improvements include enhancing current child care center meal planning practices and incorporating nutrition quality as a component of quality of care within state QRIS'. These improvements could increase the healthfulness of the foods served within child care centers, improve the nutrition provided to children, and thus support children's overall health and academic performance and help prevent the development of disease-related risk factors.

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CHAPTER I

INTRODUCTION

The term dietary quality (DQ) refers to how healthy or nutritious a diet is as determined by its score output provided by a dietary quality index or indicator (DQI). The Healthy Eating Index (HEI) is one DQI that evaluates and scores diets based on how closely they align with the Dietary Guidelines for Americans (USDA, 2018). The most updated version of the HEI, the HEI-2015, evaluates and scores diets based on their alignment with the 2015-2020 Dietary Guidelines for Americans (USDA, 2018). The national average HEI-2015 score for children aged 2-17 years is 53.9, for adults aged 18-64 years is 58.3, for older adults aged 65+ years is 64.0, and for all Americans aged 2+ years is 58.7 out of 100 (United States Department of Agriculture [USDA], 2019). This indicates that the average diet of Americans does not align with federal dietary recommendations (USDA, 2019). Research supports that DQ impacts nearly every aspect of life within child and adult populations, including physical and mental health, development of disease-related risk factors, academic performance, and more (Belot & James, 2011; Dahm et al., 2016; Golley et al., 2010; Haapala et al., 2015; McCurley et al., 2019; Okubo et al., 2015; O'Neil et al., 2014; Parletta et al., 2019; Perry et al., 2015; Wirt & Collins, 2009; Wu et al., 2019). The national average HEI scores coupled with research on DQ impact may indicate that the current diets of Americans are not supporting overall health and academic performance and could be contributing to the development of disease-related risk factors. The nutrition provided to children and adults needs to be improved to reap the benefits of DQ. Within the child population, increasing the healthfulness of the foods served within child care programs may offer a solution.

As of 2020, over 220,000 child care programs exist in the US and over 2,400 in Oklahoma alone (Child Care Aware of America, 2021). Several states have established Quality Rating Improvement Systems (QRIS) to evaluate child care quality (Child Care Aware of America, 2021). In Oklahoma, an indication of child care quality is provided through the Oklahoma Department of Human Services (OKDHS) QRIS, Reaching for the Stars (OKDHS, 2021). Regarding nutrition, several child care programs participate in the Child and Adult Care Food Program (CACFP). The CACFP is a federal Child Nutrition Program (CNP) offered by the USDA with the overarching goal of impacting the overall wellness and healthy growth and development of U.S. children and adults (USDA, 2021b; USDA, 2021c). By participating in the CACFP, child care programs can provide nutritious meals and snacks to eligible children and adults (USDA, 2021b; USDA, 2021c). Various programs are eligible to participate in the CACFP, such as child care centers and institutions, day care homes, afterschool care programs, adult day care centers, and emergency shelters (USDA, 2021b; USDA, 2021c). The CACFP serves more than 4.2 million children and 138,000 adults daily. As of 2018, there were over 66,000 CACFP-participating child care centers and over 96,000 CACFP-participating family child care homes in the US (Food Research & Action Center [FRAC], 2019; USDA, 2021b).

The influence that child care programs have coupled with what we know about the impact of DQ sheds light on the importance of ensuring that child care providers, of CACFP-participating and non-CACFP-participating child care programs, have the resources they need to serve foods that contribute to high DQ to best support the populations they serve. There are no known studies to date, however, that have determined the average DQ of posted menus served at child care centers in Oklahoma as compared to the DQ of a best practice (BP) menu and that have assessed for differences in DQ between posted menus served at CACFP-participating and non-CACFP-participating child care centers and between posted menus served at Three Star rated and non-Three Star rated child care centers in Oklahoma, as assessed by the OKDHS' QRIS,

Reaching for the Stars. The purpose of this study was to examine the average DQ of posted lunch menus served at child care centers in Oklahoma from a sample of Oklahoma child care centers, overall as well as between those with and without a Three Star rating, those participating or not in the CACFP, and compared to a BP lunch menu. The objectives of this study were to:

1. Determine the average total and average component DQ scores of posted lunch menus served at child care centers in Oklahoma from a sample of Oklahoma child care centers.
2. Compare the average total and average component DQ scores of the posted lunch menus to the average total and average component DQ scores of a BP lunch menu.
 - a. We hypothesized that the average total and average component DQ scores of the posted lunch menus would be lower than the average total and average component DQ scores of the BP lunch menu.
3. Assess for differences between the average total and average component DQ scores of posted lunch menus served at CACFP-participating and non-CACFP-participating child care centers in Oklahoma from a sample of Oklahoma child care centers.
 - a. Based on previous literature, we hypothesized that the average total and average component DQ scores of posted lunch menus served at CACFP-participating child care centers would be higher than the average total and average component DQ scores of posted lunch menus served at non-CACFP-participating child care centers.
4. Assess for differences between the average total and average component DQ scores of posted lunch menus served at Three Star rated and non-Three Star rated child care centers in Oklahoma from a sample of Oklahoma child care centers.

- a. While there is no known literature comparing DQ to star ratings, we hypothesized that the average total and average component DQ scores of posted lunch menus served at Three Star rated child care centers would be higher than the average total and average component DQ scores of posted lunch menus served at non-Three Star rated child care centers.
5. Make recommendations on how the CACFP lunch/supper meal pattern requirements can be improved upon from a DQ standpoint from the comparison of the DQ scores of the posted lunch menus to the DQ scores of the BP lunch menu if differences exist.

CHAPTER II

REVIEW OF LITERATURE

As of 2020, there are over 220,000 child care programs consisting of child care centers and homes in the US (Child Care Aware of America, 2021). In Oklahoma alone, there are over 2,400 child care programs (Child Care Aware of America, 2021). With this vast influence and selection of providers, it is crucial to ensure that the care provided to children within child care programs is of quality.

Several states have developed QRIS' to evaluate child care quality (Child Care Aware of America, 2021). In Oklahoma, an indication of child care quality is provided through the OKDHS' QRIS, Reaching for the Stars (OKDHS, 2021). Reaching for the Stars was developed to improve the quality of care provided within child care programs in Oklahoma (OKDHS, 2021). Four levels are integrated within Reaching for the Stars, and each level has criteria that a child care program must meet to attain the level's respective star rating (OKDHS, 2021). A One Star rating is the baseline level star rating and signifies that the program meets minimum licensing requirements (OKDHS, 2021). A One Star Plus rating is the second higher star rating and indicates that the program meets additional quality criteria, including administrative practices, such as having a professional development plan; offering some level of professional development; providing a learning environment for children that includes daily reading, physical activity, and little to no screen time; providing family engagement activities; and having some sort of program evaluation established (OKDHS, 2021). A Two Star rating is the third highest

Star rating and signifies that the program meets the criteria of One Star and One Star Plus ratings and has additional administrative practices, professional development in Early Learning Guidelines, teachers/providers with increased qualifications, a learning environment that includes the Early Learning Guidelines, and provides additional family engagement activities (OKDHS, 2021). A Three Star rating is the highest possible star rating and signifies that the program meets the criteria of One Star, One Star Plus, and Two Star ratings and has “national accreditation from a CCS [Child Care Services]-approved source” or is a “Head Start in compliance with performance standards” (OKDHS, 2021). Child care programs’ star ratings are visible to the public and, often, are a factor that parents and guardians look at in high regard when selecting a child care provider for their child. By visiting the OKDHS’ Child Care Locator website, parents and guardians can quickly search among the child care providers in Oklahoma and see each provider’s star ratings in their search (OKDHS, 2014). An estimated 92% of Oklahoma child care programs are rated within the Reaching for the Stars QRIS (Child Care Aware of America, 2021). In terms of nutrition, several child care programs participate in the CACFP.

Child Nutrition Programs

The USDA Food and Nutrition Service identifies nine CNPs created to provide children with nutritious foods within schools, child and adult care centers and institutions, day care homes, and other eligible community settings to prevent hunger and obesity (USDA, 2022). These CNPs include the School Breakfast Program (SBP), National School Lunch Program (NSLP), Fresh Fruit and Vegetable Program (FFVP), Afterschool Snack Program (ASSP), Special Milk Program (SMP), CACFP, CACFP At-Risk Afterschool Meal Program, Summer Food Service Program (SFSP), and the Seamless Summer Option (SSO).

Child and Adult Care Food Program

While several of the CNPs were designed for schools, the CACFP was designed for child care centers and institutions, day care homes, afterschool care programs, adult day care centers, and emergency shelters to provide eligible children and adults at these locations with nutritious meals and snacks (USDA, 2021c). Programs such as the SBP, NSLP, ASSP, and SMP can also be implemented within child care settings, but a benefit of participating in the CACFP is that it includes breakfast, lunch/supper, and snack meal patterns, encompassing all the meals included within the SBP, NSLP, and ASSP combined (USDA, 2012; USDA, 2013b; USDA, 2017a; USDA, 2017b). Participating in the CACFP, therefore, offers the opportunity for eligible sites to serve nutritious foods to eligible children and adults throughout the day (USDA, 2021b). Another benefit of participating in the CACFP is that eligible sites can receive reimbursements for the meals that they serve (USDA, 2021b).

The history of the CACFP dates to 1853, when the Children's Aid Society created the first school food service program (National CACFP Sponsors Association, 2021). It was not until 1965 that child care centers were provided federal support for food service programs. In 1968, Congress included the Child Care Food Program (CCFP) within the USDA CNPs, and in 1978, the CCFP was modified and became permanent by public law. In 1989, Congress authorized the expansion of the CCFP to include adults within adult day care centers, changing the name to the CACFP (National CACFP Sponsors Association, 2021). In 1998, the Child Nutrition Reauthorization Act introduced the requirement for the USDA to provide state agencies that oversee the CACFP with information about the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (USDA, 1999). More recently, in 2016, the CACFP meal pattern requirements were updated in response to the introduction of the Healthy, Hunger-Free Kids Act (HHFKA) of 2010 to better align the programs meal pattern requirements with the Dietary Guidelines for Americans and to better meet the needs of the populations the program

serves (Institute of Child Nutrition [ICN], 2021). Today, the CACFP serves more than 4.2 million children and 138,000 adults daily (USDA, 2021b).

In general, sites eligible to participate in the CACFP include public and private nonprofit child care centers, child care centers that operate outside regular school hours, Head Start programs, and similar sites that are licensed/approved to provide child care services (USDA, 2021b). Additional sites eligible to participate in the CACFP include public and private nonprofit adult day care centers that are licensed/approved to provide nonresidential care services to adults aged 60 years and older and those who are functionally impaired (USDA, 2021b). Individuals enrolled at these sites are eligible to participate in the CACFP if they fall into any of the following categories: children ages 12 years and under, children of migrant workers who are 15 years and under, children or adults who are physically or mentally disabled, adults ages 60 years and older, or adults who are functionally impaired (OSDE, 2021b). Sites submit claims for meal reimbursement based on the number of meals served to enrolled individuals in the categories mentioned above (OSDE, 2021b). The specific reimbursement amounts paid to the sites reflect federal poverty levels and are determined by the enrolled individuals' respective household sizes and income levels (OSDE, 2021b).

Sites that fall under the descriptors listed above may contact their state agency for more information on how to apply for CACFP participation (USDA, 2021b). In Oklahoma, the state administering agency is the Oklahoma State Department of Education (OSDE). To determine site eligibility in Oklahoma, providers can complete an online application on the OSDE website (OSDE, 2021c). After a site has been deemed eligible, the next step in the application process is to visit the CACFP Applications System website and log in with the provided username and password specific to the site (CACFP Solutions, 2021; OSDE, 2021a; OSDE, 2021c). The OSDE offers a document that outlines how to complete the remaining steps of the CACFP application and how to navigate the CACFP Applications System website (OSDE CNPs, 2017). The

remaining steps of the application process include providing the required documentation, completing required training, and scheduling a site visit with a state representative (CACFP Solutions, 2021; OSDE, 2021c). Once all steps are complete and the application is approved, the site can begin participating in the CACFP and receive reimbursements for the meals they serve (CACFP Solutions, 2021; OSDE, 2021c). This process may differ from state to state.

To receive reimbursement, CACFP-participating sites are required to serve meals that meet the CACFP meal pattern requirements, follow food safety standards, and provide food of quality (OSDE, 2021b). The USDA established these meal pattern requirements, or nutrition standards, to align with the Dietary Guidelines for Americans (OSDE, 2021b; USDA, 2013a). Because the CACFP serves multiple populations, meal pattern requirements have been established for infants, children, and adults (USDA, 2013a). The infant meal pattern requirements are split into 0-5- and 6-11-months age groups; the child meal pattern requirements are split into 1-2, 3-5, 6-12, and 13-18-years age groups; and the adult meal pattern requirements apply to adults of all ages (USDA, 2013a). All CACFP meal patterns include breakfast, lunch/supper, and snacks (USDA, 2013a). CACFP-participating sites may receive reimbursement for a maximum of three meals per day per participant (OSDE, 2021b). These meals can include two primary meals (breakfast, lunch, and supper) and one snack or one primary meal and two snacks (OSDE, 2021b). Table 1 illustrates the minimum CACFP meal pattern requirements for the 3-5 years age group (USDA, 2021e). Child care centers that do not participate in the CACFP are not required to follow any meal pattern requirements, nor are they eligible for reimbursement.

Table 1*CACFP Meal Pattern Requirements for Ages 3-5 Years*

Food Components	Meal		
	Breakfast	Lunch and Supper	Snack (Must Include 2 of the 5 Components)
Milk	¾ cup	¾ cup	½ cup
Meat and Meat Alternates		1 ½ oz	½ oz
Vegetables	½ cup	¼ cup	½ cup
Fruits		¼ cup	½ cup
Grains	½ oz eq*	½ oz eq	½ oz eq

*Meat and meat alternates may be substituted in place of the grain component up to three times per week.

CNP meal pattern requirements are revised periodically to uphold the most up-to-date nutrition and scientific recommendations. The most recent updates to the CACFP meal pattern requirements were made in April 2016 following the introduction of the HHS FKA of 2010 (ICN, 2021). Within the HHS FKA was a call to action to revise the CACFP meal pattern requirements to ensure that they align with the Dietary Guidelines for Americans and best meet the needs of the populations the program serves (ICN, 2021). Updates to the CACFP meal pattern requirements included a greater variety of fruits and vegetables, increased whole grain requirements, more protein options, the introduction of the 13–18-year age group, less added sugar, and more (USDA, 2021e).

When changes occur to CNPs increasing the provision of healthier food items, there may be concerns for issues with transition, such as increased waste or poor compliance; however, some studies show this is not necessarily the case (Chriqui et al., 2020; Kenney et al., 2020). In a

study by Kenney et al. (2020), researchers looked at the impact of the CACFP meal pattern requirement updates proposed in 2016 and implemented in 2017 on child dietary intake in family child care homes. They found that dietary intakes after CACFP meal pattern requirement updates in the summer-fall of 2018 consisted of higher fruit consumption by nearly one-third of a serving ($p=0.03$) and higher whole grain consumption by roughly one-half of a serving ($p=0.002$) as compared to intakes before the meal pattern requirement updates in summer-fall of 2017 (Kenney et al., 2020). In another study by Chriqui et al. (2020), researchers found that after implementation of the CACFP meal pattern requirement updates, CACFP-participating centers served more 100% whole grain products ($p=0.043$), less processed meats and flavored milk ($p<0.001$ and $p=0.038$, respectively), and the number of centers never serving high sugar cereals increased ($p<0.001$). Chriqui et al. (2020) noted that these findings did not apply to all CACFP-participating centers included in their study.

Alternatively, some factors may regularly impact CACFP-participating sites' ability to meet the CACFP meal pattern requirements consistently. A systematic review from 2017 looked at 12 studies, 6 qualitative and 6 quantitative, to determine which factors impact child care centers' abilities to consistently serve meals that meet the dietary guidelines (Seward et al., 2017). Of the 12 studies, the most prevalent barrier and facilitator to serving meals that meet the dietary guidelines was environmental context and resources (Seward et al., 2017). This means that the environment, organization, resources, and interactions of and within child care centers play the most significant role in either impeding or facilitating the center's ability to serve meals that meet dietary guidelines (Seward et al., 2017). While adhering to the CACFP meal pattern requirements may be difficult for some sites for various reasons, CACFP-participating sites must follow the program's meal pattern requirements closely, one reason being to provide children with nutritionally balanced meals that align with federal dietary recommendations. A cross-sectional survey from 2020 aimed to compare the composition of meals served at CACFP-participating

sites to meals served at non-CACFP-participating sites (Gurzo et al., 2020). In their survey, the researchers found that CACFP-participating child care centers and homes served significantly more meals and snacks, fruits, vegetables, meats, poultry, fish, eggs, whole grains, water, and milk and significantly less candy, salty snacks, and sugary drinks than non-CACFP-participating child care centers and homes (Gurzo et al., 2020). In addition to providing children with meals that align with federal dietary recommendations, CACFP-participating sites should closely follow the CACFP's meal pattern requirements to receive reimbursements for the meals that they serve.

As previously stated, CACFP-participating sites may receive reimbursement for three meals per day per participant. These meals can include two primary meals (breakfast, lunch, and supper) and one snack or one primary meal and two snacks (OSDE, 2021b). Reimbursements are made to CACFP-participating sites based on the number of meals served, the number of enrolled participants, and the current reimbursement rates (OSDE, 2021b). Reimbursement rates vary by site type and whether the meals served were free or charged at a reduced price or full price to the participant, as determined by the participant's household sizes and income levels (OSDE, 2022). For example, in 2021, the reimbursement rate for a free breakfast meal served at a CACFP care center in Oklahoma was \$1.89, a reduced-price breakfast meal was \$1.59, and a full-price breakfast meal was \$0.32 (OSDE, 2022).

While participating in the CACFP and following its participation standards may sound like a daunting task, there are a variety of resources available online that can be used for guidance. The ICN provides various CACFP meal pattern resources, and the USDA's Team Nutrition offers CACFP meal pattern training worksheets on each of their respective websites (ICN, 2021; USDA, 2021a). In addition, the National Smarter Mealtimes for Child Care Settings Scorecard serves as a resource for child care providers to evaluate and score themselves on their ability to promote healthy eating practices to the children they serve (Smarter Lunchrooms Movement, 2017). These resources and others can help child care providers at CACFP-

participating sites meet the minimum meal pattern requirements and standards so that their sites can continue to receive reimbursement for the meals that they serve. Alternatively, if CACFP-participating sites do not comply with the CACFP meal pattern requirements, they risk losing their eligibility to participate in the CACFP. Additionally, non-compliance with the CACFP meal pattern requirements could negatively impact the DQ of the meals served to CACFP participants.

Dietary Quality

The term DQ refers to how healthy or nutritious a diet is as determined by its score output provided by a DQI. DQIs are scoring systems that evaluate and score diets based on how closely they align with current nutrition knowledge and dietary guidelines and recommendations within a framework of scoring standards that cover an array of food groups or components (Gil et al., 2015; USDA, 2018). Generally, the higher the scoring output determined by a DQI, the healthier or more nutritious the diet is. The most popular DQIs include the HEI, the Diet Quality Index, the Healthy Diet Indicator, and the Mediterranean Diet Score (Gil et al., 2015).

The HEI is one DQI that evaluates and scores diets based on how closely they align with the Dietary Guidelines for Americans (USDA, 2018). The most updated version of the HEI, the HEI-2015, evaluates and scores diets based on their alignment with the 2015-2020 Dietary Guidelines for Americans (USDA, 2018). The HEI-2015's framework for evaluating and scoring diets includes 13 components covering determinants for adequacy and moderation within the diet (USDA, 2018). Adequacy components include total fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, and fatty acids (USDA, 2018). Moderation components include refined grains, sodium, added sugars, and saturated fats (USDA, 2018). Higher scores within the adequacy components reflect higher intakes in the diet because higher intakes of these items are favored. In comparison, higher scores within the moderation components reflect lower intakes in the diet because lower intakes of these

items are favored (USDA, 2018). The HEI-2015 standardizes DQ scoring by setting minimum and maximum possible scores within each of the 13 components and standardizes quantity by scoring per 1,000 calories/kcals (USDA, 2018). HEI-2015 score outputs range from 0 to 100, with 0 being the lowest possible score/DQ and 100 being the highest possible score/DQ (USDA, 2018). An HEI-2015 score of 100 indicates that the diet is in full alignment with federal dietary recommendations outlined in the 2015-2020 Dietary Guidelines for Americans (USDA, 2018). Researchers Guenther et al. (2014) and Reedy et al. (2018) found that the HEI-2010 and the HEI-2015, respectively, are valid and reliable measures of DQ.

The national average HEI-2015 score for children aged 2-17 years is 53.9, for adults aged 18-64 years is 58.3, for older adults aged 65+ years is 64.0, and for all Americans aged 2+ years is 58.7 out of 100 (USDA, 2019). As previously mentioned, HEI-2015 scores are based on the 2015-2020 Dietary Guidelines for Americans, which indicates that the average diet of Americans does not align with federal dietary recommendations (USDA, 2019).

Dietary Quality Impact

Several studies have looked at DQ within child and adult populations and have discovered that DQ influences overall health, including physical and mental health, development of disease-related risk factors, academic performance, and more.

Regarding physical health, Perry et al. (2015) found that diets of low DQ were associated with increased overweight prevalence in children and that diets of higher DQ were associated with normal weight in children. Okubo et al. (2015) found that diets of low DQ consumed between 6-12 months were significantly associated with higher adiposity at 6 years of age. Regarding mental health, O'Neil et al. (2014) found that children with poor dietary patterns had significantly poorer mental health than children with healthier dietary patterns. Wu et al. (2019) found that children who consumed diets of higher DQ or who had healthier dietary patterns

reported having a higher health-related quality of life, as measured by the health-related quality of life (HRQoL) evaluation construct, and that children who consumed diets of lower DQ or who had unhealthy dietary patterns reported lower HRQoL. Similarly, Parletta et al. (2019) found that when adults with depression consumed diets of increased DQ, as compared to their usual diets, for three months, they reported decreased depression and anxiety, improved coping mechanisms, and improved quality of life.

Regarding disease-related risk factors, Dahm et al. (2016) found that diets of high DQ in adolescence were associated with a decreased risk of cardiovascular disease and related risk factors later in life. McCurley et al. (2019) discovered that adults who consumed diets of higher DQ had less prevalence of cardiometabolic risk factors, such as obesity, prediabetes/diabetes, and hypertension, than adults who consumed diets of lower DQ. Similarly, Wirt and Collins (2009) found that diets of high DQ consumed in adulthood were associated with reduced all-cause mortality, cardiovascular disease risk, cardiovascular disease mortality, cancer mortality, and all-cause cancer risk. Wirt and Collins (2009) summarized that DQ scores and poor health outcomes are generally inversely related.

Finally, regarding academic performance, Haapala et al. (2015) discovered that diets of lower DQ were associated with poorer cognition in children. Golley et al. (2010) found that children had higher alertness in the classroom when DQ was improved in schools. Similarly, Belot and James (2011) discovered that implementing a healthy eating campaign in schools resulted in significant improvements in children's academic performance in English and science and decreased school absences by 14%.

The studies discussed above and numerous others on DQ have revealed the significant impact that DQ has on nearly all aspects of life, including physical and mental health, development of disease-related risk factors, academic performance, and more in children and

adults (Belot & James, 2011; Dahm et al., 2016; Golley et al., 2010; Haapala et al., 2015; McCurley et al., 2019; Okubo et al., 2015; O’Neil et al., 2014; Parletta et al., 2019; Perry et al., 2015; Wirt & Collins, 2009; Wu et al., 2019). The national average HEI scores previously mentioned coupled with the research on DQ impact may indicate that the current diets of Americans are not supporting overall health and academic performance and could be contributing to the development of disease-related risk factors. The nutrition provided to children and adults needs to be improved to reap the benefits of DQ. Within the child population, increasing the healthfulness of the foods served within child care programs may offer a solution.

Child Care Programs’ Potential Impact on Dietary Quality

As previously mentioned, there are over 220,000 child care programs in the US and over 2,400 in Oklahoma alone (Child Care Aware of America, 2021). The CACFP is a federal CNP offered by the USDA that eligible child care programs can participate in to provide nutritious meals and snacks to eligible children and adults (USDA, 2021b; USDA, 2021c). The CACFP serves more than 4.2 million children and 138,000 adults daily, and as of 2018, there were over 66,000 CACFP-participating child care centers and over 96,000 CACFP-participating family child care homes in the US (FRAC, 2019; USDA, 2021b). The number of children participating in CACFP-participating day care homes is declining, but the number of children participating in CACFP-participating child care centers is rising and has resulted in an increase in total CACFP participation from 2.7 million children in 2000 to 4.7 million children in 2019 (USDA ERS, 2021). The recent COVID-19 pandemic has potentially contributed to the drop in participation to 4.2 million children (USDA ERS, 2021). Nonetheless, the CACFP serves a vast population nationally. The broad reach of child care programs and their influence on the nutrition provided to children, coupled with what is known about the impact of DQ, sheds light on the importance of ensuring that child care providers of CACFP-participating and non-CACFP participating child

care programs have the resources they need to serve foods that contribute to high DQ to best support the populations they serve.

Cooking for Kids

Cooking for Kids is a culinary training program initially designed for school nutrition programs participating in the federally funded CNPs throughout Oklahoma (Cooking for Kids, 2021d). Cooking for Kids was developed by the OSDE, Child Nutrition, and the Oklahoma State University Department of Nutritional Sciences and is housed at the Oklahoma State University Stillwater, Oklahoma campus (Cooking for Kids, 2021d). Cooking for Kids offers culinary skill development training; child nutrition leadership training; chef consultations on menu development, procurement, scheduling, and marketing; and more (Cooking for Kids, 2021c; Cooking for Kids, 2021d). In addition, Cooking for Kids offers numerous educational resources on their website ranging from recipes, webinars, videos, handouts, and more (Cooking for Kids, 2021a; Cooking for Kids, 2021b).

Cooking for Kids was created in 2013 as a pilot program for child nutrition professionals in schools in response to the introduction of the HHFKA in 2010. The legislation and resulting regulations required changes to be made within CNPs offered in schools regarding their respective meal pattern requirements beginning in the 2012-2013 school year. These changes included increasing the amounts and variety of fruits and vegetables, and quantities of whole grains served and decreasing the amounts of fat and sodium served in schools. These changes were significant and therefore challenging and shed light on the need for culinary training and assistance for child nutrition professionals in schools.

Further, the recently introduced School Food Modernization Act, the amendment of the original Richard B. Russel National School Lunch Act of 1946, would provide financial support for the modernization of school lunch facilities and training to school food service personnel

(Congress.gov, 2021; USDA, 2017a). In support of this act, the Pew Charitable Trusts further recommends that third-party trainers “develop and administer training and technical assistance” to school food service personnel (The Pew Charitable Trusts, 2015). The training that Cooking for Kids provides is in alignment with the goals of the School Food Modernization Act and the recommendations of the Pew Charitable Trusts.

As of 2022, over 1,275 school nutrition professionals representing over 200 Oklahoma school districts have attended Cooking for Kids’ culinary skill development training and have received over 22,850 hours of continuing education. This has resulted in over 110,600 students having increased access to healthier meals. Additionally, since 2022, 95 Oklahoma schools have received a chef consultation from Cooking for Kids generating a 110% increase in meals made from scratch or almost scratch cooking methods in chef consult schools, a 26% increase in the use of Smarter Lunchrooms strategies, a 26% increase in consumption of fruit, and a 57% increase in consumption of whole-grain rich foods in schools. Throughout 2023 and beyond, Cooking for Kids aims to further enhance the quality of meals served to children and increase student acceptability and participation in CNPs.

In response to a request from the OSDE, beginning with the federal fiscal year 2022, Cooking for Kids expanded its focus to developing training, educational webinars, recipes, menus, and resources beyond schools to CACFP-participating sites, specifically child care programs. To ensure efforts addressed the needs of the child care programs, Cooking for Kids conducted a needs assessment in September 2021 that was distributed to child care providers in Oklahoma through the OSDE’s e-claims website. A total of 76 representatives responded in part, with 61 complete responses. Table 2 summarizes the needs assessment findings that pertained to Cooking for Kids’ training development process.

Table 2*Cooking for Kids CACFP Needs Assessment Findings*

Questions	Response Options	Responses Total (%)
1. How many staff does your center have to prepare and serve meals?	1-2	41 (60.29%)
	3-5	9 (13.24%)
	More than 5	18 (26.47%)
	Total	68 (100%)
2. How many children does your center serve?	Less than 25	6 (8.82%)
	25-50	23 (33.82%)
	50-100	21 (30.88%)
	More than 100	18 (26.47%)
	Total	68 (100%)
3. Which meals does your center serve? Select all that apply.	Breakfast	65 (31.55%)
	Lunch	67 (32.52%)
	Snacks	61 (29.61%)
	Supper	13 (6.31%)
	Total	206 (100%)
4. How many days each week does your center prepare made-from-scratch or almost-scratch entrees?	Always: 5 days per week	19 (29.23%)
	Most days of the week: 3 to 4 days	20 (30.77%)
	Some days of the week: 1 to 2 days	19 (29.23%)
	Never	7 (10.77%)
	Total	65 (100%)
5. The staff (cooks) in our center have enough time to prepare meals using more scratch or almost scratch cooking.	Strongly agree	16 (24.62%)
	Agree	27 (41.54%)
	Disagree	16 (24.62%)
	Strongly disagree	6 (9.23%)
	Total	65 (100%)
6. We have the equipment we need in our center to prepare meals using more scratch or almost scratch cooking.	Strongly agree	20 (30.3%)
	Agree	29 (43.94%)
	Disagree	13 (19.7%)
	Strongly disagree	4 (6.06%)
	Total	66 (100%)
7. The staff (cooks) in our center have the skills needed to prepare meals using more scratch or almost scratch cooking.	Strongly agree	27 (40.91%)
	Agree	28 (42.42%)
	Disagree	7 (10.61%)
	Strongly disagree	4 (6.06%)
	Total	66 (100%)
8. Please rank the following knowledge areas or skills from 1 to 9 using the scale below.	Food safety	1: 21 (34.43%)*
	Kitchen math	1: 13 (21.31%)
		2: 15 (24.59%) 3: 14 (22.95%)

1 = Very much needed by the staff (cooks) in our center to prepare more scratch/almost scratch meals. 9 = Not needed at all by the staff (cooks) in our center to prepare more scratch/almost scratch meals.	Using standardized recipes	2: 14 (22.95%) 3: 13 (21.31%) 4: 11 (18.03%)
	Flavoring with herbs and spices	4: 18 (29.51%) 5: 10 (16.39%) 6: 13 (21.31%)
	Vegetable cookery	5: 22 (36.07%) 6: 11 (18.03%) 7: 15 (24.59%)
	Whole grain cookery	6: 16 (26.23%) 7: 13 (21.31%)
	Time management	1: 11 (18.03%) 2: 9 (14.75%) 3: 14 (22.95%) 7: 10 (16.39%)
	Knife skills	7: 8 (13.11%) 8: 34 (55.74%)

*Responses for question 8 follow the following format: Rank (1-9): responses total (%).

The needs assessment findings revealed that 40% of responding programs reported preparing made-from-scratch and almost-scratch meals at their programs 3 or more days per week. Likewise, most programs reported having enough time, the equipment required, and the skills to prepare meals using scratch or almost scratch cooking methods (66%, 74%, and 83%, respectively). The needs assessment findings also revealed that the primary perceived needs of these programs included training on food safety, kitchen math, using standardized recipes, and time management. These findings are consistent with those of Seward et al. (2017).

To address these needs, Cooking for Kids developed a CACFP Culinary Skill Development Training that ran throughout 2022. The training covered food safety topics, including food storage, preparation, serving, and clean up; kitchen math; standardized recipes; and time management, including mise en place practices. Registration for the training was available through the Oklahoma Professional Development Registry to all Oklahoma child care providers. While the training was initially developed for CACFP-participating child care programs, the training content was applicable to all child care programs regardless of CACFP participation and program type (i.e., center, home, etc.). As an attendance incentive, Cooking for Kids attained approval for their training to count towards child care programs' OKDHS Reaching

for the Stars star rating, specifically within the Health and Safety category. Educational webinars, recipes, menus, and a desk reference resource guide supplemented in-person training. Recipes and menus developed by Cooking for Kids aimed to improve the DQ of child care meals and only required equipment commonly available in child care settings, such as baking sheets, ovens, and stoves, and included measurement units widely used in child care settings, such as cups, teaspoons, and tablespoons. Breakfast, lunch/supper, and snack menus were developed by a Cooking for Kids chef using Cooking for Kids made-from-scratch and almost scratch-prepared recipes, which can be found on the Cooking for Kids program website, paired with additional food items, such as milk and fruit, to, at the baseline level, meet the CACFP food component requirements listed in Table 1. Finally, the desk reference resource guide included CACFP meal patterns, meal crediting and planning, child nutrition labels, kitchen measurements, portion sizes, equipment substitutions, whole grain equivalency, food purchasing, food safety, and more.

The Gap in Knowledge

In summary, the national average HEI-2015 score for children aged 2-17 years is 53.9 out of 100, indicating that the average diets of children do not align with federal dietary recommendations (USDA, 2019). Further, DQ impacts nearly all aspects of children's lives, including physical and mental health, development of disease-related risk factors, academic performance, and more (Belot & James, 2011; Dahm et al., 2016; Golley et al., 2010; Haapala et al., 2015; McCurley et al., 2019; Okubo et al., 2015; O'Neil et al., 2014; Parletta et al., 2019; Perry et al., 2015; Wirt & Collins, 2009; Wu et al., 2019). The national average HEI scores, coupled with the research on the impact of DQ, may indicate that the current diets of children are not supporting their overall health and academic performance and could be contributing to the development of disease-related risk factors. The nutrition provided to children needs to be improved to reap the benefits of DQ. Increasing the healthfulness of the foods served within child care centers may offer a solution.

The purpose of this study was to examine the average DQ of posted lunch menus served at child care centers in Oklahoma from a sample of Oklahoma child care centers, overall as well as between those with and without a Three Star rating, those participating or not in the CACFP, and compared to a BP lunch menu. To date, no known studies have investigated the objectives of this study. The findings of this study may encourage child care centers to increase the DQ of the meals they serve and may inform how to improve the CACFP lunch/supper meal pattern requirements from a DQ standpoint.

CHAPTER III

METHODOLOGY

Study Design and Sampling

This study involved a cross-sectional content analysis of 10-day/2-week posted lunch menus from child care centers in Oklahoma and of a 10-day/2-week BP lunch menu created by a Cooking for Kids chef and researchers.

The 20 posted lunch menus included in this study were obtained through snowball sampling. Posted lunch menus were obtained from Oklahoma child care providers that registered to attend Cooking for Kids' CACFP Culinary Skill Development Training in person and by email, voluntarily, through online searches on Oklahoma child care center websites, and by word of mouth. To assist in the online search process and to determine whether the obtained posted lunch menus were from CACFP-participating or non-CACFP-participating child care centers, an alphabetized list of all CACFP-participating child care programs in Oklahoma was obtained from the OSDE through an Open Records Request (OSDE, 2020). This list contained 511 unique programs, 43 of which were excluded as they were either Head Start programs, affiliated with an organization that may have nutrition standards exceeding the CACFP, or as they exclusively served adult populations resulting in a total population of 468 centers. During the online search process, every 15th center on the list of the 468 centers meeting inclusion criteria were selected, starting with the 15th center on the list, and an online search for the center's posted lunch menu was conducted.

Additional centers were selected as needed, starting with the following 15th center on the list, and so on. Once a posted lunch menu from a CACFP-participating child care center was obtained through any of the methods described above, that center was removed from the list for randomization accuracy in the online search process.

To ensure that the obtained posted lunch menus were from child care centers rather than homes, that the centers were licensed to provide child care in Oklahoma, and to determine the centers' OKDHS Reaching for the Stars star rating, the centers' name was searched for on the OKDHS Oklahoma Child Care Locator website under the 'centers' filter (OKDHS, 2014). If this information could not be verified, the menu was excluded from the study. Finally, posted lunch menus were filed as either from a CACFP-participating or a non-CACFP-participating child care center by searching for the center's name on the alphabetized list of all CACFP-participating child care centers in Oklahoma. The sampling methods described above ensued until resources were exhausted, resulting in a total sample of 20 posted lunch menus.

Additionally, a 10-day/2-week BP lunch menu was created for comparison in DQ to the 20 posted lunch menus. The BP lunch menu was inspired by the Cooking for Kids chef-made Fall Lunch/Supper Cycle Menu. The cycle menu utilized Cooking for Kids made-from-scratch and almost scratch-prepared recipes paired with additional food items, such as milk and fruit, to, at the baseline level, meet the CACFP lunch/supper food component requirements listed in Table 1 (Cooking for Kids, 2021b). Two researchers in the study revised this cycle menu to create the BP lunch menu to achieve the highest possible total and component DQ scores while also being feasible and realistic for child care centers to implement and serve. Similar BP methodology has been used in previous research on CNP DQ (Joyce et al., 2018). The BP lunch menu and the Cooking for Kids Fall Lunch/Supper Cycle Menu can be found in Appendix A and Appendix B, respectively.

Nutrient and Dietary Quality Analysis

For consistency in analysis across the 20 posted lunch menus, the meals served within the first 10-days/2-weeks were utilized for nutrient and DQ analysis. When a posted lunch menu spanned only 5-days/1-week, the week was duplicated to generate a 10-day/2-week menu.

To determine nutrient provision and then DQ, portions and specificity of foods offered must be determined. Regarding portions of foods, all foods listed in the meals served within the 10-day/2-week posted lunch menus were portioned following the minimum CACFP lunch/supper meal pattern requirements for the 3-5 years age group listed in Table 1 regardless of whether the menus represented CACFP-participating or non-CACFP-participating child care centers. In terms of specificity of foods, when the posted lunch menus did not specify food characteristics needed for nutrient analysis (e.g., type of milk or fruit), assumptions were made by the researchers based on CNP and DQ expertise and experience (see Appendix C). Regarding the specificity of foods within the BP lunch menu, as previously mentioned, the menu included Cooking for Kids made-from-scratch and almost scratch-prepared recipes paired with additional food items, such as milk and fruit to, at the baseline level, meet the CACFP lunch/supper food component requirements listed in Table 1. In terms of portions of foods, the BP lunch menu was also portioned following the minimum CACFP lunch/supper meal pattern requirements for the 3-5 years age group listed in Table 1 (see Appendix A).

Once food portions and specificity were determined, all posted lunch menus and the BP lunch menu were entered into the ESHA Food Processor Nutrient Analysis software (version 11.9.0, 2020) to determine the calorie, fat, sodium, and added sugar content needed for DQ scoring. As there are sometimes hundreds of options for food items in nutrient analysis programs, when available, USDA standard reference food item options were utilized to ensure accuracy and thoroughness of nutrient data. A list of ESHA codes was also utilized to ensure consistent

assumptions across non-specified food items (e.g., cheese pizza) and that variability in nutrient provision of menus was due to the menu and not the assumptions of researchers, as done in similar studies on CNP menu DQ (Hanson et al., 2020; Joyce et al., 2018; Joyce et al., 2020; Patel et al., 2020; Simmons et al., 2022).

Utilizing the nutrient analysis data, total and component DQ scores were assessed for each day within the 20 posted lunch menus and the BP lunch menu using the HEI-2015 (Krebs-Smith et al., 2018). The HEI evaluates and scores diets based on how closely they align with the Dietary Guidelines for Americans (USDA, 2018). The most updated version of the HEI, the HEI-2015, evaluates and scores diets based on their alignment with the 2015-2020 Dietary Guidelines for Americans (USDA, 2018). The HEI-2015's framework for evaluating and scoring diets includes 13 components covering determinants for adequacy and moderation within the diet (USDA, 2018). Adequacy components include total fruits, whole fruits, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant proteins, and fatty acids (USDA, 2018). Moderation components include refined grains, sodium, added sugars, and saturated fats (USDA, 2018). Higher scores within the adequacy components reflect higher intakes in the diet because higher intakes of these items are favored, while higher scores within the moderation components reflect lower intakes in the diet because lower intakes of these items are favored (USDA, 2018). The HEI-2015 standardizes DQ scoring by setting minimum and maximum possible scores within each of the 13 components and standardizes quantity by scoring per 1,000 calories/kcals (USDA, 2018). HEI-2015 score outputs range from 0 to 100, with 0 being the lowest possible score/DQ and 100 being the highest possible score/DQ (USDA, 2018). An HEI-2015 score of 100 indicates that the diet is in complete alignment with federal dietary recommendations as outlined in the 2015-2020 Dietary Guidelines for Americans (USDA, 2018). Researchers Guenther et al. (2014) and Reedy et al. (2018) found that the HEI-2010 and the HEI-2015, respectively, are valid and reliable measures of DQ. Additionally, the HEI is an appropriate

measure of DQ for CNPs since CNPs are based on the Dietary Guidelines for Americans, and the HEI evaluates and scores diets based on how closely they align with the Dietary Guidelines for Americans (USDA, 2018).

Statistical Analysis

Descriptive statistics were used to determine the average total and average component DQ scores and standard deviations of all posted lunch menus, of all menus served at CACFP-participating child care centers, of all menus served at non-CACFP-participating child care centers, of all menus served at Three Star rated child care centers, of all menus served at non-Three Star rated child care centers, and of the BP lunch menu. Three separate two-sample independent t-tests were used to determine if there were significant differences between the average total and average component DQ scores of all posted lunch menus and the BP lunch menu, between all menus served at CACFP-participating child care centers and all menus served at non-CACFP-participating child care centers, and between all menus served at Three Star rated child care centers and all menus served at non-Three Star rated child care centers. All statistical analyses were performed using the SPSS statistical software (version 25, standard, IBM, Armonk, NY), and the significance level was set at $p < 0.05$.

Human Subjects Approval Statement

The study's protocol was submitted to the Oklahoma State University Institutional Review Board and deemed exempt from oversight (see Appendix D).

CHAPTER IV

FINDINGS

The purpose of this study was to measure and compare posted lunch menu DQ using HEI scores overall and of various types of child care centers in Oklahoma. The obtained menus represented 12 CACFP-participating child care centers and 8 non-CACFP-participating child care centers. Of the 20 child care centers, 9 were Three Star rated and 11 were non-Three Star rated child care centers. A total of 6 menus were obtained from Oklahoma child care providers that registered to attend Cooking for Kids' CACFP Culinary Skill Development Training in person and by email, voluntarily, 6 through online searches on Oklahoma child care center websites, and 8 by word of mouth.

Table 3 shows the HEI scores of the posted lunch menus in comparison to the HEI scores of the BP lunch menu. The BP lunch menu had an average 18.3-point (29.25%) higher total HEI score and scored higher within all HEI components than the posted lunch menus. The posted lunch menus reached the maximum possible HEI component scores for total protein and added sugar. The BP lunch menu achieved the maximum possible HEI component scores for whole fruit, whole grains, dairy, total protein, refined grains, and added sugar. Significant differences in HEI scores between the posted lunch menus and the BP lunch menu included whole grains [mean \pm standard deviation, posted lunch menus = 1.0 ± 2.24 , BP lunch menu = 10.0, % difference ([mean difference / posted menus] * 100) = 900.0%, $p = 0.001$] and total score [posted lunch menus = 62.6 ± 5.64 , BP lunch menu = 80.91, % difference = 29.25%, $p = 0.005$] favoring higher

DQ in the BP lunch menu. Additionally, while no significant differences were found, scores for dark greens/legumes and seafood/plant protein trended lower in the posted lunch menus than the BP lunch menu. There were no significant differences in HEI scores favoring higher DQ in the posted lunch menus. Figure 1 displays a visual comparison of the DQ scores of the posted lunch menus to the DQ scores of the BP lunch menu as percentages of the maximum possible HEI scores.

Table 3*DQ Scores of the Posted Lunch Menus in Comparison to the DQ Scores of the BP Lunch Menu*

HEI Scoring Components (Max Score)	Posted Menus Scores (mean \pm standard deviation) (n = 20)	Best Practice Menu Scores (mean) (n = 1)	Mean Difference (Best Practice Menu - Posted Menus)	% Difference ([Mean Difference / Posted Menus] * 100)	p-value
Total Fruit (5)	4.25 \pm 1.17	4.35	0.1	2.35	0.932
Whole Fruit (5)	4.38 \pm 1.22	5.0	0.62	14.16	0.624
Total Vegetable (5)	4.15 \pm 0.3	4.2	0.05	1.2	0.874
Dark Greens/Legumes (5)	1.43 \pm 0.8	3.0	1.57	109.79	0.07
Whole Grains (10)	1.0 \pm 2.24	10.0	9.0	900.0	0.001*
Dairy (10)	9.05 \pm 2.93	10.0	0.95	10.5	0.754
Total Protein (5)	5.0 \pm 0.0	5.0	0.0	0.0	
Seafood/Plant Protein (5)	1.28 \pm 0.66	2.0	0.72	56.25	0.296
Fatty Acid Ratio (10)	1.93 \pm 0.99	3.94	2.01	104.15	0.061
Refined Grains (10)	9.24 \pm 0.89	10.0	0.76	8.23	0.416
Sodium (10)	6.07 \pm 1.45	6.9	0.83	13.67	0.584
Added Sugar (10)	10.0 \pm 0.0	10.0	0.0	0.0	
Saturated Fat (10)	4.84 \pm 1.57	6.52	1.68	34.71	0.308
Total (100)	62.6 \pm 5.64	80.91	18.31	29.25	0.005*

*Indicates significant difference (p<0.05).

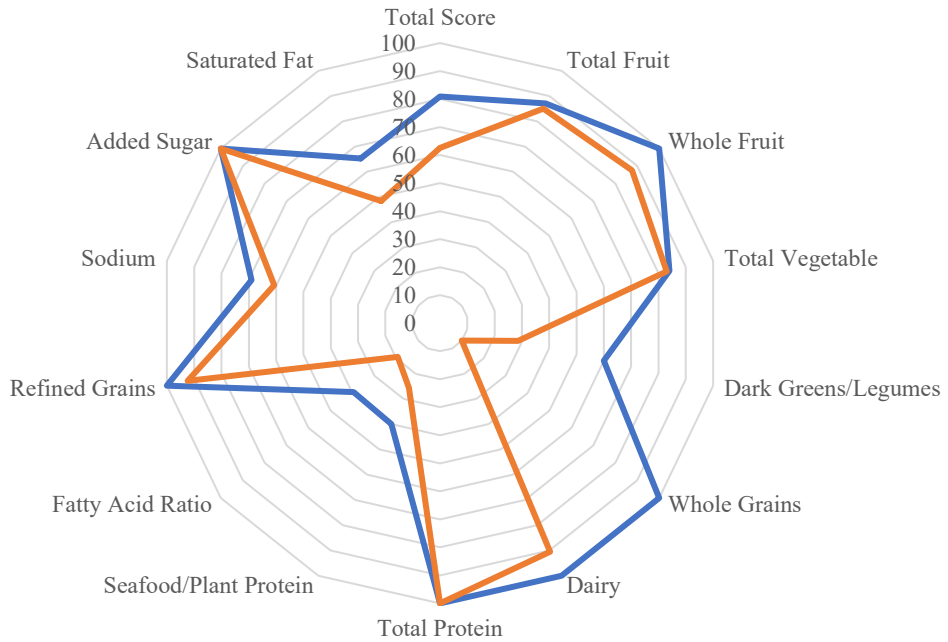


Figure 1

Radar Graph of the DQ Scores of the Posted Lunch Menus (in Orange) in Comparison to the DQ Scores of the BP Lunch Menu (in Blue), As Percentages of Maximum Possible HEI Scores

Table 4 shows the DQ scores of the posted lunch menus served at CACFP-participating child care centers in comparison to the DQ scores of the posted lunch menus served at non-CACFP-participating child care centers. Although no statistically significant differences were noted, the posted lunch menus served at CACFP-participating child care centers had an average 5.16-point (8.67%) higher total HEI score and scored higher within HEI components of total fruit, whole fruit, whole grains, dairy, refined grains, and sodium as compared to the posted lunch menus served at non-CACFP-participating child care centers ($ps > 0.05$). The posted lunch menus served at non-CACFP-participating child care centers scored higher within HEI components of total vegetable, dark greens/legumes, seafood/plant protein, fatty acid ratio, and saturated fat than the posted lunch menus served at CACFP-participating child care centers ($ps > 0.05$). Both posted lunch menu types reached the maximum possible HEI component scores for total protein and added sugar. Additionally, the posted lunch menus served at CACFP-participating child care centers achieved the maximum possible HEI component score for dairy.

Table 4

DQ Scores of the Posted Lunch Menus Served at CACFP-Participating Child Care Centers in Comparison to the DQ Scores of the Posted Lunch Menus Served at Non-CACFP-Participating Child Care Centers

HEI Scoring Components (Max Score)	CACFP Menus Scores (mean ± standard deviation) (n = 12)	Non-CACFP Menus Scores (mean ± standard deviation) (n = 8)	Mean Difference (CACFP Menus - Non-CACFP Menus)	% Difference ([Mean Difference / Non-CACFP Menus] * 100)	p-value
Total Fruit (5)	4.46 ± 0.88	3.92 ± 1.52	0.54	13.78	0.322
Whole Fruit (5)	4.58 ± 0.93	4.06 ± 1.59	0.52	12.81	0.365
Total Vegetable (5)	4.12 ± 0.28	4.2 ± 0.35	-0.08	-1.9	0.611
Dark Greens/Legumes (5)	1.29 ± 0.66	1.63 ± 0.99	-0.34	-20.86	0.375
Whole Grains (10)	1.58 ± 2.77	0.13 ± 0.35	1.45	1,115.38	0.099
Dairy (10)	10.0 ± 0.01	7.63 ± 4.41	2.37	31.06	0.172
Total Protein (5)	5.0 ± 0.0	5.0 ± 0.0	0.0	0.0	
Seafood/Plant Protein (5)	1.13 ± 0.43	1.5 ± 0.89	-0.37	-24.67	0.221
Fatty Acid Ratio (10)	1.89 ± 1.07	1.98 ± 0.91	-0.09	-4.55	0.841
Refined Grains (10)	9.63 ± 0.21	8.66 ± 1.21	0.97	11.2	0.059
Sodium (10)	6.53 ± 1.45	5.38 ± 1.23	1.15	21.38	0.08
Added Sugar (10)	10.0 ± 0.0	10.0 ± 0.0	0.0	0.0	
Saturated Fat (10)	4.45 ± 1.61	5.43 ± 1.38	-0.98	-18.05	0.178
Total (100)	64.66 ± 3.75	59.5 ± 6.78	5.16	8.67	0.079

Table 5 shows the DQ scores of the posted lunch menus served at Three Star rated child care centers in comparison to the DQ scores of the posted lunch menus served at non-Three Star rated child care centers. Although no statistically significant differences were noted, the posted lunch menus served at non-Three Star rated child care centers had an average 1.39-point (2.25%) higher total HEI score and scored higher within HEI components of total fruit, whole fruit, dark greens/legumes, dairy, seafood/plant protein, fatty acid ratio, refined grains, and saturated fat as compared to the posted lunch menus served at Three Star rated child care centers ($ps > 0.05$). The posted lunch menus served at Three Star rated child care centers scored higher within HEI components of total vegetable, whole grains, and sodium than those served at non-Three Star rated child care centers ($ps > 0.05$). Both posted lunch menu types reached the maximum possible HEI component scores for total protein and added sugar.

Table 5

DQ Scores of the Posted Lunch Menus Served at Three Star Rated Child Care Centers in Comparison to the DQ Scores of the Posted Lunch Menus Served at Non-Three Star Rated Child Care Centers

HEI Scoring Components (Max Score)	Three Star Rated Menus Scores (mean ± standard deviation) (n = 9)	Non-Three Star Rated Menus Scores (mean ± standard deviation) (n = 11)	Mean Difference (Non-Three Star Rated Menus - Three Star Rated Menus)	% Difference ([Mean Difference / Three Star Rated Menus] * 100)	p-value
Total Fruit (5)	3.97 ± 1.35	4.48 ± 1.01	0.51	12.85	0.349
Whole Fruit (5)	4.06 ± 1.4	4.64 ± 1.05	0.58	14.29	0.303
Total Vegetable (5)	4.28 ± 0.34	4.04 ± 0.23	-0.24	-5.61	0.075
Dark Greens/Legumes (5)	1.33 ± 1.0	1.5 ± 0.63	0.17	12.78	0.655
Whole Grains (10)	1.44 ± 2.96	0.63 ± 1.48	-0.81	-56.25	0.434
Dairy (10)	8.89 ± 3.33	9.18 ± 2.71	0.29	3.26	0.833
Total Protein (5)	5.0 ± 0.0	5.0 ± 0.0	0.0	0.0	
Seafood/Plant Protein (5)	1.17 ± 0.87	1.36 ± 0.45	0.19	16.24	0.52
Fatty Acid Ratio (10)	1.8 ± 0.86	2.03 ± 1.11	0.23	12.78	0.625
Refined Grains (10)	9.19 ± 1.08	9.28 ± 0.76	0.09	0.98	0.824
Sodium (10)	6.41 ± 1.82	5.79 ± 1.09	-0.62	-9.67	0.357
Added Sugar (10)	10.0 ± 0.0	10.0 ± 0.0	0.0	0.0	
Saturated Fat (10)	4.29 ± 1.54	5.29 ± 1.51	1.0	23.31	0.161
Total (100)	61.83 ± 5.96	63.22 ± 5.57	1.39	2.25	0.599

CHAPTER V

CONCLUSION

The purpose of this study was to examine the average DQ of posted lunch menus served at child care centers in Oklahoma from a sample of Oklahoma child care centers, overall as well as between those with and without a Three Star rating, those participating or not in the CACFP, and compared to a best practice lunch menu. Despite hypothesizing several significant differences in menu comparisons tested, significant differences were only noted in comparing all posted lunch menus to the BP lunch menu.

The current analysis is the first known study to date to determine the average DQ of posted menus served at child care centers in Oklahoma as compared to the DQ of a BP menu and to assess for differences in DQ between posted menus served at CACFP-participating and non-CACFP-participating child care centers and between posted menus served at OKDHS' Three Star rated and non-Three Star rated child care centers in Oklahoma. The results of this study provide evidence that incorporating best practices for meal planning has the potential to significantly improve the HEI scores of lunch menus served within child care centers compared to current meal planning practices to meet but not greatly exceed CACFP standards. The higher total HEI score found in this study was driven mainly by increased servings of whole grains in the BP lunch menu compared to the posted lunch menus. Based on this and other noted differences in posted and BP lunch menus, recommendations include incorporating vegetable subgroups such that dark green vegetables and legumes are required to be served and increasing whole grain requirements.

These recommended improvements would increase scores within HEI components of total vegetable, dark greens/legumes, whole grains, total protein, and seafood/plant protein.

Collectively with these recommendations implemented, there would be a potential increase of 11 points in the total HEI scores of the lunch menus served at child care centers. Furthermore, these recommended improvements would increase the healthfulness of the foods served within child care centers, improve the nutrition provided to children, support children's overall health and academic performance, and help prevent the development of disease-related risk factors (Belot & James, 2011; Dahm et al., 2016; Golley et al., 2010; Haapala et al., 2015; McCurley et al., 2019; Okubo et al., 2015; O'Neil et al., 2014; Parletta et al., 2019; Perry et al., 2015; Wirt & Collins, 2009; Wu et al., 2019).

No significant differences were found between the total and component HEI scores of posted lunch menus served at CACFP-participating and non-CACFP-participating child care centers. Noteworthy is the difference in scores within the HEI component of refined grains, which neared significance ($p=0.059$), favoring CACFP-participating child care centers serving less refined grains as compared to non-CACFP-participating child care centers. Similar findings are displayed within HEI components of whole grains ($p=0.099$) and sodium ($p=0.08$) as well as total score ($p=0.079$), favoring higher DQ in the posted lunch menus served at CACFP-participating child care centers. This lack of significant differences in HEI scores was unexpected as child care centers that do not participate in the CACFP are not required to follow meal pattern requirements as those that participate in the CACFP are. This finding may have been impacted by the portioning of the posted lunch menus served at non-CACFP-participating child care centers following the minimum CACFP lunch/supper meal pattern requirements for the 3-5 years age group listed in Table 1 and by the utilization of the specific ESHA codes used within this study due to the lack of specification of the portions and types of foods served on the obtained menus.

Similar to the findings between CACFP and non-CACFP-participating child care centers, no significant differences were found between the total and component HEI scores of posted lunch menus served at Three Star rated and non-Three Star rated child care centers. The hypothesis that the average total and average component DQ scores of posted lunch menus served at Three Star rated child care centers would be higher than the average total and average component DQ scores of posted lunch menus served at non-Three Star rated child care centers was not supported by the findings of this study. This finding was not unexpected in that the OKDHS' QRIS, Reaching for the Stars, does not include criteria for nutrition standards, practices, or participation in the CACFP (OKDHS, 2021).

The findings of this study mostly align with previously published literature. In a study by Andreyeva et al. (2021), researchers found that in a sample of Connecticut child care centers, centers that participated in the CACFP were more likely to follow nutrition standards and served more whole grains and low-fat milk than centers that did not participate in the CACFP. The current study's findings align with those of Andreyeva et al. (2021), given that the posted lunch menus served at CACFP-participating child care centers scored higher within HEI components of whole grains and dairy as compared to the posted lunch menus served at non-CACFP-participating child care centers. The current study did not discover significant differences in HEI scores favoring higher DQ in either of the posted lunch menu types. Additionally, in a study by Gurzo et al. (2020), researchers found that in a sample of California child care centers and homes, those that participated in the CACFP served more vegetables, lean proteins, eggs, whole grains, and milk than those that did not participate in the CACFP. The findings of the current study mostly align with those of Gurzo et al. (2020), except in the current study, it was found that the posted lunch menus served at CACFP-participating child care centers scored lower within HEI components of total vegetable and dark greens/legumes as compared to the posted lunch menus served at non-CACFP-participating child care centers. Again, the current study did not discover

significant differences in HEI scores favoring higher DQ in either of the posted lunch menu types. Regarding implications for practice, Loth et al. (2019) found that CACFP-participating child care center providers adhered to nutrition-related BP recommendations when they were provided.

Based on previous literature by Loth et al. (2019), it can be inferred that, if implemented, the recommended improvements for incorporating best practices into child care center meal planning practices provided by the current study would be accepted by child care centers. Coupled with the current study's findings, incorporating best meal planning practices has the potential to significantly improve the HEI scores of lunch menus served within child care centers compared to current meal planning practices. Given the influence that child care centers have on the nutrition provided to children coupled with what we know about the impact of DQ, light is shed on the importance of ensuring that child care providers serve foods that contribute to high DQ to best support the populations they serve. Should the recommended improvements provided by the current study take effect, resources should also be allocated such that child care centers are able to implement meal planning best practices successfully.

Strengths

Strengths of this study include that when food specifications were not provided in menus while completing nutrient analysis for all posted lunch menus and the BP lunch menu to determine the calorie, fat, sodium, and added sugar content needed for DQ scoring, ESHA codes used for food items included USDA standard references and those utilized in similar studies on DQ (Hanson et al., 2020; Joyce et al., 2018; Joyce et al., 2020; Patel et al., 2020; Simmons et al., 2022). When assessing DQ, the HEI-2015 was used. The HEI was an appropriate measure of DQ for this study since CNPs, like the CACFP, are based on the Dietary Guidelines for Americans, and the HEI evaluates and scores diets based on how closely they align with the Dietary Guidelines for Americans (USDA, 2018). Additionally, researchers Guenther et al. (2014) and

Reedy et al. (2018) found that the HEI-2010 and the HEI-2015, respectively, are valid and reliable measures of DQ. Finally, actual posted lunch menus from child care centers in Oklahoma were used within this study, making the analysis more realistic and representative of the meals served within child care centers in Oklahoma.

Limitations

Limitations of this study include the small sample size of only 20 posted lunch menus. When reviewing the child care center locations in which the posted lunch menus were obtained, most of the centers were located in Northeastern Oklahoma. Therefore, this study's findings may not represent the state as a whole or the broader US. Regarding food portions and the specificity of foods within the posted lunch menus, several assumptions had to be made to perform nutrient and DQ analyses. For example, food portions were not specified on any of the posted lunch menus from non-CACFP-participating child care centers, so these menus were portioned following the minimum CACFP lunch/supper meal pattern requirements for the 3-5 years age group listed in Table 1 to provide more conservative estimates of differences in DQ. If a food component was not listed on the posted lunch menu (e.g., fruits), it was assumed that the food component was not served. Additionally, because exact recipes for food items were not provided on the posted lunch menus and for consistency across nutrient analyses, recipes for common food items served in child care centers were created and repeated (e.g., pizza, sandwiches, spaghetti, etc.). Because of these assumptions, the DQ findings, especially of the posted lunch menus from non-CACFP-participating child care centers, may not reflect what is actually served within child care centers. Assumptions regarding the specificity of foods served may have influenced the significant differences found in the HEI whole grain component scores between the posted lunch menus and the BP lunch menu but may also have influenced the lack of significance overall by limiting opportunities for true variation. To best guide assumption decision-making, assumptions

were made by the researchers based on CNP and DQ expertise and experience. A list of all assumptions made can be found in Appendix C.

Directions for Future Research

Future research should include larger sample sizes, utilize a sample of posted lunch menus more representative of the state of Oklahoma or the broader US, and obtain detailed information on food portions and specificity of foods to perform more accurate nutrient and DQ analyses as compared to the current study. As of June 2022, the OKDHS has launched a new QRIS called The Stars program (OKDHS, 2022). The Stars program is a five-level rating system compared to the OKDHS' previous QRIS, Reaching for the Stars, which was a four-level rating system (OKDHS, 2021; OKDHS, 2022). Although the current study found no significant differences in HEI scores between posted lunch menus served at Three Star rated and non-Three Star rated child care centers as assessed by the Reaching for the Stars QRIS, future research could assess for differences in DQ between posted menus served at child care centers of differing star ratings as assessed by The Stars program.

Implications for Practice

Viewing the findings of this study from a social-ecological model perspective, practice implications can be made at the policy, organizational, and interpersonal levels. Within the policy level, the findings of this study reveal areas for improvement within current child care center meal planning practices in terms of DQ. Recommendations include incorporating vegetable subgroups such that dark green vegetables and legumes are required to be served and increasing whole grain requirements. These recommended improvements would increase scores within HEI components of total vegetable, dark greens/legumes, whole grains, total protein, and seafood/plant protein and would therefore increase the total HEI scores of posted lunch menus served at child care centers.

Regarding the organizational level, despite the findings of this study but based on findings of others, participating in the CACFP offers the opportunity for eligible sites to serve nutritious foods that align with the Dietary Guidelines for Americans to children throughout the day (OSDE, 2021b; USDA, 2013a; USDA, 2021b). Because of this, resources should be allocated such that more child care programs can easily participate in the CACFP. Also, at the organizational level, the findings of this study reveal an area for improvement within state QRIS' rating criteria, incorporating nutrition quality as a component of quality of care. For example, CACFP participation status could be incorporated within individual child care center quality ratings as assessed by state QRIS'. This improvement may further increase the number of child care programs participating in the CACFP, ensuring that more children receive nutritious foods that align with the Dietary Guidelines for Americans.

At the interpersonal level, the findings of this study support that parents of children in child care should select child care centers that participate in the CACFP such that their children receive nutritious foods that align with the Dietary Guidelines for Americans. Additionally, with current rating criteria lacking nutritional guidance, parents should utilize QRIS data only to determine the quality of care within child care centers.

Conclusion

The findings of this study show that CACFP participation and quality ratings of child care centers do not impact DQ in Oklahoma, while also revealing areas for improvement at both the policy and organizational levels. At the policy level, improvements to current child care center meal planning practices would directly increase the healthfulness of the foods served within child care centers, improve the nutrition provided to children, and would support children's overall health and academic performance, and help prevent the development of disease-related risk factors (Belot & James, 2011; Dahm et al., 2016; Golley et al., 2010; Haapala

et al., 2015; McCurley et al., 2019; Okubo et al., 2015; O’Neil et al., 2014; Parletta et al., 2019; Perry et al., 2015; Wirt & Collins, 2009; Wu et al., 2019). Supportively, at the organizational level, incorporating nutrition quality as a component of quality of care within state QRIS’ may further increase the number of child care programs participating in the CACFP, further supporting children’s overall health and academic performance and preventing the development of disease-related risk factors.

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APPENDICES

APPENDIX A

Best Practice Lunch Menu

Monday	Tuesday	Wednesday	Thursday	Friday
<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Beef LoMein • 1/4 cup Edamame • 1/4 cup Pears 	<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Chicken and Noodles • 1/4 cup Italian Roasted Broccoli • 1/4 cup Grapes 	<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Green Chili Pork Burrito • 1/4 cup Apples 	<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Chicken Tikka Salad • 1/4 cup Kale Salad • 1/4 cup Strawberries • 1/2 oz WG Roll 	<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Tuna Salad Sandwich • 1/4 cup Celery Sticks • 1/4 cup Apples
Monday	Tuesday	Wednesday	Thursday	Friday
<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Spaghetti with Meat Balls • 1/4 cup Spinach Salad • 1/4 cup Pears 	<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Baja Fish Tacos • 1/4 cup Black Bean and Corn Salsa • 1/4 cup Apples 	<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Sloppy Joe • 1/4 cup Roasted Autumn Vegetables • 1/4 cup Grapes 	<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Italian Sandwich • 1/4 cup Sugar Snap Peas • 1/4 cup Mandarin Oranges 	<ul style="list-style-type: none"> • 6 fl oz Unflavored Low-Fat Milk • 3/4 Serving Sweet and Sour Chicken • 1/4 cup Edamame • 1/4 cup Diced Pears

APPENDIX B

Cooking for Kids' Fall Lunch/Supper Cycle Menu

Monday	Tuesday	Wednesday	Thursday	Friday
<ul style="list-style-type: none"> • Milk • Mac n Cheese • Italian Roasted Broccoli • Fresh Seasonal Fruit 	<ul style="list-style-type: none"> • Milk • Vegetarian Chili • Fresh Seasonal Fruit • Cornbread 	<ul style="list-style-type: none"> • Milk • Chicken and Noodles • Roasted Butternut Squash • Fresh Seasonal Fruit 	<ul style="list-style-type: none"> • Milk • Cheese Pizza • Roasted Okra • Strawberries 	<ul style="list-style-type: none"> • Milk • Tuna Salad Sandwich • Celery Sticks • Apple Wedges
<ul style="list-style-type: none"> • Milk • Spaghetti with Meatballs • Spinach Salad with Roasted Vegetables • Fresh Seasonal Fruit 	<ul style="list-style-type: none"> • Milk • Beef LoMein • Roasted Autumn Vegetables • Fresh Seasonal Fruit 	<ul style="list-style-type: none"> • Milk • Sloppy Joe • Roasted Corn • Fresh Seasonal Fruit 	<ul style="list-style-type: none"> • Milk • Italian Sandwich • Sugar Snap Peas • Mandarin Oranges 	<ul style="list-style-type: none"> • Milk • Cheesy Rice • Green Beans • Diced Pears

APPENDIX C

Posted Lunch Menu Assumptions

Milk Notes:

- The type of milk served was not specified on any of the posted lunch menus, so it was assumed that unflavored low-fat milk was served across all menus.

Fruits Notes:

- When the type of fruit served was not specified on a posted lunch menu, a pattern of fruits commonly served in child care centers was created and repeated (e.g., pineapples, peaches, pears, mandarin oranges, and apples).

Grains Notes:

- When the type of grain served was not specified on a posted lunch menu, it was assumed that an enriched grain was served.

General Menu Notes:

- The portions of foods served were not specified on any of the posted lunch menus from non-CACFP-participating child care centers, so these menus were portioned following the minimum CACFP lunch/supper meal pattern requirements for the 3-5 years age group listed in Table 1. If a food component was not listed on the posted lunch menu (e.g., fruits), it was assumed that the food component was not served.
- Because exact recipes for food items were not provided on the posted lunch menus and for consistency across nutrient analyses, recipes for common food items served in child care centers were created and repeated (e.g., pizza, sandwiches, spaghetti, etc.).

APPENDIX D

Oklahoma State University Institutional Review Board Human Subjects Approval



Oklahoma State University Institutional Review Board

Application Number: HS-19-3
Proposal Title: Comprehensive Cooking for Kids Evaluation

Principal Investigator: Deana Hildebrand
Co-Investigator(s): Cass Ring
Faculty Adviser:
Project Coordinator:
Research Assistant(s):

Status Recommended by Reviewer(s): Approved

Study Review Level: Exempt
Modification Approval Date: 01/20/2022

The modification of the IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46. The original expiration date of the protocol has not changed.

Modifications Approved:

Modifications Approved: A knowledge survey for child care center employees will be added.

Training attendee will be asked to provide a copy of their center's cycle menu. From the menus, Cooking for Kids will evaluate dietary quality.

The final versions of any recruitment, consent and assent documents bearing the IRB approval stamp are available for download from IRBManager. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved.
2. Submit a status report to the IRB when requested
3. Promptly report to the IRB any harm experienced by a participant that is both unanticipated and related per IRB policy.
4. Maintain accurate and complete study records for evaluation by the OSU IRB and, if applicable, inspection by regulatory agencies and/or the study sponsor.
5. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

Sincerely,

Oklahoma State University IRB
223 Scott Hall, Stillwater, OK 74078
Website: <https://irb.okstate.edu/>
Ph: 405-744-3377 | Fax: 405-744-4335 | irb@okstate.edu

VITA

Makayla Simmons

Candidate for the Degree of

Master of Science

Thesis: IMPACT OF CACFP PARTICIPATION AND QUALITY RATINGS OF
CHILD CARE CENTERS ON DIETARY QUALITY

Major Field: Nutritional Sciences

Biographical:

Education:

Completed the requirements for the Master of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in May, 2023.

Completed the requirements for the Bachelor of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in 2021.

Experience:

Graduate Research Assistant within the Oklahoma State University Department

of Nutritional Sciences for Cooking for Kids from August 2021 to
January 2023.

Professional Memberships:

Student member of the Academy of Nutrition and Dietetics, Oklahoma
Academy of Nutrition and Dietetics, Oklahoma City District Dietetic
Association, North Central District Dietetic Association, American
Society for Nutrition, and Oklahoma Student Association of Nutrition
and Dietetics.