2019

Nutritional Content of Mississippi Child Care Centers Participating in the Child and Adult Care Food Program: 1995 to 2019

Katelyn Marie Inserra
University of Mississippi

NUTRITIONAL CONTENT OF MISSISSIPPI CHILD CARE CENTERS PARTICIPATING IN THE CHILD AND ADULT CARE FOOD PROGRAM: 1995 to 2019

by
Katelyn Marie Inserra

A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of the requirements of the Sally McDonnell Barksdale Honors College.

Oxford
May 2019

Approved by

Kathy B. Knight
Advisor: Dr. Kathy Knight

Anne K Bomba
Reader: Dr. Anne Bomba

Laurel Lambert
Reader: Dr. Laurel Lambert

Copyright Page

Acknowledgments

I would like to thank Dr. Kathy Knight for guiding me through this thesis and encouraging me to pursue research in nutrition. Without her support and patience, I would have never been able to learn as much about childhood nutrition as I have. I would like to thank Dr. Scott Knight for his help with the statistics portion of this thesis. I would like to thank Dr. Anne Bomba and Dr. Laurel Lambert for serving as my second and third readers, respectively. I am grateful for my friends and family for their constant support and encouragement throughout my thesis research, as well as my entire collegiate career. I would also like to thank the Institute of Child Nutrition for allowing me access to their facility and providing me with the NutriKids software to use for my analysis. Their work in childhood nutrition and obesity prevention helped inspire this thesis and has made an impact on the country as a whole. Lastly, I would like to thank the Sally McDonnell Barksdale Honors College for all the opportunities is has provided me with over the past four years. Without the SMBHC, I would have never taken a nutrition course or recognized my interest in child nutrition.

List of Tables

List of Figures

Table of Contents

Abstract

Childhood obesity rates are increasing in the United States and the condition is more prevalent in the Southeast than in other areas of the country. Children who are obese or overweight during childhood have a much higher chance of remaining overweight throughout their lives, and the best way to combat child obesity is through influencing young children's nutrition patterns. Many children spend a significant amount of time in childcare outside of their home, which may be responsible for providing adequate nutrition for at least two meals per day. This study evaluated the menus of Mississippi childcare centers participating in the Children and Adult Care Food Program (CACFP). Cycle menus for each center were analyzed for nutritional quality using NutriKids software. Mean daily nutrient content was calculated from one business week of menus from each center, and compared to data from a 1995 study by Oakley, Bomba, Knight, and Byrd. T-tests were used to determine the significance of the differences in the mean amounts of nutrients provided between menus from the 1995 study and the current menus. A checklist was also distributed to examine adherence to CACFP best practices and guidelines. The results showed that although the menus are still high in carbohydrates and calories from sugar, current menus were significantly lower in total and unsaturated fat, and significantly higher in iron, calcium, Vitamin C, and fiber than menus from the 1995 study. Changes in CACFP guidelines during the past twenty years may have helped centers reduce the amount of fat and increased the amount of key nutrients in menus compared to the 1995 study. While it is important to continue exploring nutritional content of childcare menus, the new CACFP guidelines may be making a positive impact.

Introduction

Currently in America, obesity rates have reached an all-time high, and continually increase each year (Maron, 2018). Research has shown that the Southern States have a higher prevalence of overweight and obese adults and adolescents. In addition, the rate of obesity in children and adolescents is alarmingly high, which leads to an increase in overweight and obese adults. Mississippi not only has the highest rates of obesity in the country as a whole population, but its child obesity rates are much higher than in most other regions of the country (Center for Disease Control, 2012).

In recent years, the American diet has shifted to a convenience modeled eating pattern. Most people gravitate towards foods that are easily accessible and require minimal effort to prepare (Brunner, T., Horst, van der, K. & Siegrist, M., 2010). However, these foods are typically calorie-dense and nutrient deficient (Monteiro, Moubarac, Cannon, & Popkin, 2013). The high sugar and high fat diet is appealing to children as well as adults, so they often choose these empty-calorie foods over more nutrient-dense choices. Children observe adults' eating habits, and this can influence their food choices and eating behaviors throughout life (Hannon, Bowen, Moinpour & McLerran, 2003). To help combat the obesity epidemic in America, children should be instructed on healthy eating at a young age. School systems and child care facilities play an important role in child and adolescent nutrition in the United States as many children receive the majority of their meals from school and child care centers (Organization for Economic Cooperation and Development, 2016). However, it is up to the individual

centers to decide what they are feeding children on a daily basis. The Child and Adult Care Program (CACFP) has developed standards leading to more nutrient dense menus in many childcare centers, but additional research is needed to analyze the nutritional content of menus provided in participating CACFP childcare centers. In order to provide higher quality of nutrition to children and adolescents, more must be known about what is being served to the children. Then, if needed, this will help drive the development and enforcement of policies to improve menus in child care facilities.

The purpose of this study was to determine if childcare centers participating in CACFP are meeting the Dietary Guidelines for Americans (DGA) put in place through the United States Office of Disease Prevention and Health Promotion (U.S. Department of Health and Human Services & U.S. Department of Agriculture, 2015). This was completed through distributing a survey on best practices for early childhood nutrition, and a request for one week of lunch menus to a random sample of participating CACFP facilities. The menus were then analyzed for nutrient content and adherence to the DGA (U.S. Department of Health and Human Services & U.S. Department of Agriculture, 2015).

Literature Review

Childhood Obesity

Childhood obesity has become an increasingly alarming epidemic in the United States. Almost 34% of children, and more specifically, 26.2% of preschool aged children are overweight or are at risk of becoming overweight, which is problematic for normal growth and development. Mississippi ranks second highest for prevalence of childhood obesity in the United States, with 39% of school aged children being overweight (Dev et al., 2014; Gray, Byrd, Fountain, Rader, & Frugé, 2015). In a study concerning Head Start preschoolers, 17.1% of children ages 2-19 are overweight, a dramatic increase from statistics obtained 4 years previous (Dev, Speirs, Donovan, & Cho, 2014).

It is important to consider the causes and implications of childhood obesity, as children who are obese have an 80% likelihood of becoming obese during the remainder of their life (Nguyen et al., 1996). Childhood and adolescent obesity has been researched extensively in recent years, and has been found to be caused by four major factors: genes, metabolism, environment and behavior (Kazaks & Stern, 2013). The leading cause of adolescent obesity is genetics, with several genes having been identified as causing obesity (Stutts, 2017). During the 1960s, scientist Dr. Neel suggested the "thrifty gene hypothesis", which suggests that obesity is a "protective factor against starvation…we eat in excess in case a time comes when food is not available" (Neel, 1962). This hypothesis suggested that we eat as a precautionary measure, and have learned this over time, but that this is currently due to the readily availability of unhealthy foods, termed a "food

swamp" (Stutts, 2017). Society today has turned into an "obesogenic environment," a way of life which promotes unhealthy food and increased sedentary lifestyles (Kazaks & Stern, 2013). For example, society has made unhealthy options readily available to children and their families. Because calorie-dense foods are convenient and inexpensive, these items may be selected instead of nutrient-dense foods (Watt, Appel, Lopez, & Flores, 2015).

In the past, many overweight preschoolers were approached with a "wait-and-see" attitude, meaning many physicians thought the children would develop normal eating patterns and lose weight as they aged. However, the likelihood for children to become obese in adulthood is related to the age at which they became overweight (Nguyen, Larson, Johnson, & Goran, 1996). Due to this finding, overweight and obesity in preschoolers should be addressed early on and their diets evaluated. The importance of childhood nutrition should be recognized by parents and caregivers, child care facilities, and schools, and these entities should be supported as they try to provide adequate nutrients to children.

As the rates of overweight and obese children are increasing, the number of overweight and obese adults is increasing in a linear fashion. Studies have shown that children who struggle with being overweight as adolescents are more likely to become overweight as adults (Kaphingst & Story, 2008). The first five years of one's life are full of physical growth and development. These are the years when children build a foundation for future eating patterns, so is a critical time in their development (Savage, Fisher, & Birch, 2007). Additionally, as more women enter the workforce, and consequently spend more time away from the home, the numbers of children receiving

care from someone other than a parent has increased as well (Savage et al., 2007). Around 60% of children ages 3-4 participate in some form of child care, with 41% of pre-school aged children in child care for more than 35 hours per week (Kaphingst & Story, 2008). Many children receive up to two-thirds of their daily nutrition from child care centers (Laughlin, 2013). With children spending more time outside the home, child care facilities have an increased opportunity to impact children's diets (Hirsch, Lim & Otten, 2016). Parents typically contribute to influencing their children's eating patterns through social interactions surrounding feeding and eating. However, with children spending more time at child care centers, these caregivers are also responsible for food preferences and intake patterns which can impact the child's eating behaviors and, ultimately, their growth and weight status (Savage et al., 2007). Therefore, it is important during the pre-school years to establish lifelong healthy eating habits, and this falls more and more to child care centers as the demand for child care in the United States continues to grow.

In a recent survey, teachers and parents blamed this increase in obesity on school meals and expressed the perception that snacks and junk food were being offered at schools, instead of healthy lunches. In the United States, 34% of children under the age of 6 attend some form of child care outside the home and therefore are provided with meals prepared by the caretaker and not the family (Erinosho, Vaughn, Hales, Mazzucca, Gizlice, Treadway & Ward, 2018). In order to target childhood obesity, it is important to give caregivers the knowledge and support they need so that they can better serve children and influence their food choices. Society must evolve into a less convenience centered model. Children need to be taught at a young age about health and nutrition, in order to integrate this into their daily lives throughout adulthood and adolescence.

Child and Adult Care Food Program (CACFP)

One way the United States government is attempting to improve childhood nutrition is through the CACFP. As stated on the United States Department of Agriculture's (USDA) website, the purpose of the program is to "provide aid to child and adult care institutions … provision of nutritious foods that contribute to the wellness, healthy growth, and development of young children (U.S. Department of Health and Human Services & U.S. Department of Agriculture, 2015)." This program provides approximately 4.2 million children daily with snacks and meals, and focuses on providing free or reduced-price meals to children from lower income families (U.S. Department of Health and Human Services & U.S. Department of Agriculture, 2015). Additionally, CACFP participation is voluntary, and since state licensing requirements for family child care homes do not govern nutritional standards, there is no oversight for meals. Currently, only 42% of child care centers in Mississippi participate in CACFP and are asked to comply with CACFP nutrition standards (Erinosho et al., 2018).

According to a press release from the USDA Food and Nutrition Service, the CACFP exists to apply science-based standards to govern the nutritional quality of meals provided by child care centers and schools (Concannon, 2017). The CACFP aligns with both the *Dietary Guidelines for Americans* and the National School Lunch Program.

The Academy of Nutrition and Dietetics (AND) released a position statement in 2018 regarding childhood nutrition in schools. They stated that "comprehensive, integrated nutrition programs in preschool through high school are essential to improve the health, nutritional status, and academic performance of our nation's children" (Hayes, Contento, & Weekly, 2018). In 2010, the creation of the Healthy, Hunger-Free Kids Act

forced the USDA to update the nutrition standards for the first time in 15 years, which are based on the DGA (Hayes et al., 2018). The 2012 implementation of the USDA's Nutrition Standards for School Meals required schools to integrate a wider variety of fruits, vegetables and whole grains. It also required schools to limit the amounts of sodium, calories and saturated fats in school menus (Hayes et al., 2018). Additionally, the Healthy, Hunger-Free Kids Act required the USDA to create nutrition standards for all snacks and beverages offered to students during the school day to students (Hayes et al., 2018). This new requirement aims to limit the amount of high calorie snacks offered at schools, instead offering healthier, nutrient-dense alternatives. These new policies influenced the CACFP to update their guidelines, as well.

In 2017, the USDA implemented new regulations for the CACFP to help facilities meet the standards set by the DGA's. Some of these changes include limiting juice and added sugar consumption in order to provide children with low-sugar and sugar-free beverages; and introducing new meal patterns which incorporated more whole grains, fruits and vegetables (Andreyeva & Henderson, 2018). The program is trying to combat childhood obesity by reducing excessive caloric intake, and moderating saturated fats, added sugars and sodium in menus. In order for a lunch or supper meal to be reimbursed through CACFP, it must contain five food components which are milk, a meat or meat alternative, vegetables, fruits and grains (Andreyeva & Henderson, 2018).

Participation in CACFP has shown to have an advantage over non-participating facilities in higher intake of fruits and vegetables and more nutrient dense meals. While the majority of child care centers in Mississippi do not participate in CACFP, increased participation and amended guidelines could help to decrease childhood obesity rates.

Caregiver Impact on Eating Patterns

Over the past 30 years, the need for adequate child care has increased, which underscores the importance of the nutritional quality of meals served in childcare facilities. Early childhood nutrition has been studied in recent years regarding the effect of parental modelling and caregiver modelling. This idea is based on Bandura's social cognitive theory, which emphasizes behavioral and environmental factors on behavior (Bandura, 1986). Research has shown that eating behavior is learned in early childhood by observation (Lehto, Ray, Vespalainen, Korkalo, Nissinen, Skaffari, … Erkkola, 2019). Most young children in America attend formal child care outside of the home (Organization for Economic Cooperation and Development, 2016). Therefore, child care staff members are role models for eating patterns and behaviors (Ray, Maatta, Lehto, Roos, & Roos, 2016). Bandura's theory suggests that eating patterns are learned by observing the eating styles of the adults at their child care facility (Bandura, 1986; Lehto, 2019). For example, if staff members model healthy eating choices, children are more likely to observe this behavior and chose healthy foods as well.

Currently, a national policy does not exist to govern the standard of nutrition in child care settings. According to the American Dietetic Association (ADA), children are supposed to get ½ to 2/3 of their recommended dietary allowance (RDA) from the child care center if in full-time care, and 1/3 for part-time care (Erinosho, Dixon, Young, Brotman, & Hayman, 2011; Neelon & Briley, 2011). For child care centers participating in the CACFP, compliance to nutrition standards is monitored. The CACFP regulates adherence to meal patterns by providing children five food components from the

categories of milk, fruit, vegetable, grain or bread, and meat or meat alternate. However, the facilities are not required to provide a nutrient analysis of each meal.

In 1995, Oakley, Bomba, Knight, and Byrd conducted a study of randomly selected child care centers in Mississippi. The results of the study provided a baseline of knowledge in regards to nutrition served to children in child care settings in the state of Mississippi. Each of the ninety-two centers provided a five-day lunch menu, which was analyzed for nutritional quality. The following nutrients were analyzed: protein; total carbohydrates; simple sugars; fiber; total fat; saturated fat; polyunsaturated and monounsaturated fats; cholesterol; vitamins A, D, E, K, B6, and B12; ascorbic acid; thiamin; riboflavin; niacin; calcium; phosphorus; magnesium; iron; and zinc. Seventy-five percent of the centers reported participating in the CACFP. All but one of the centers' menus met the meal-pattern requirement set by CACFP, Mississippi licensure standards, and the *Head Start Performance Standards* (Head Start Program, 1995.)

Results from the study indicated that adherence to the meal-pattern guidelines may not guarantee consistent nutritional quality. The percentage of energy from protein, carbohydrates, fat, total fiber and sodium did not reflect implementation of the DGA's recommendations (Oakley et al., 1995). The mean amounts for calories, Vitamin B12, Vitamin E, calcium, iron, and zinc were low, and the sodium content was higher than the recommendation. The majority of the menus were planned by a nutrition coordinator who was not a registered dietitian, and others by a cook, staff members, or the director of the facility (Oakley et al., 1995). The findings of this study concluded that additional guidelines were needed for menu planning in child care centers, and training regarding DGA's recommendations should be offered to all members of staff in child care facilities.

Another study looked at meal consumption of children enrolled in child care centers in New York City in 2011. This study analyzed the nutrition practices, including food consumption, in forty facilities in diverse areas of New York City. The findings were that 39-48% of children consumed at least half of the daily recommended servings for milk, fruit, grains, or meat (Erinosho et al., 2011). However, only 17% consumed at least half of vegetables, and only 2% for all five food groups. Over 80% of the children did not consume sufficient foods to provide ½ of their RDAs, which means that the majority of children in the centers surveyed were not getting adequate nutrients (Erinosho et al., 2011). This study corroborates the findings from the study conducted in Mississippi in 1995. Both studies concluded that additional guidelines are needed in order to properly regulate nutrition in childcare settings.

Future Goals of Nutrition in America

Healthy People, a government initiative through the U.S. Department of Health and Human Services, articulates objectives once a decade regarding public health issues. The Healthy People initiative is based on the belief that setting objectives can motivate action and improve health outcomes (U.S. Department of Health and Human Services, 2010). The objectives focus on a broad range of public health issues. For 2020, the overarching goals are to: attain high-quality, longer lives free of preventable disease, disability, injury and premature death; achieve health equity, eliminate disparities, and improve the health of all groups; create social and physical environments that promote good health for all; and promote quality of life, healthy development, and healthy behaviors across all life stages (U.S. Department of Health and Human Services, 2010).

In regards to nutrition specifically, the Healthy People 2020 goals are to: reduce the proportion of children and adolescents between the ages of 2 and 19 who are considered obese; increase consumption of total vegetables, fruit, whole grains, and calcium; reduce the consumption of solid fats, added sugars, and sodium (U.S. Department of Health and Human Services, 2010). These objectives published by the government align with previous findings from the 1995 Oakley et al. study regarding the nutritional standards for child care facilities. In order to meet these objectives set by the Healthy People initiative, changes need to be made in government policy for standardizing menus for child care facilities.

Methods

Participants

This study was approved by the Institutional Review Board of the University of Mississippi in spring 2017. Data was collected through the University of Mississippi Department of Nutrition and Hospitality Management under the direction of Dr. Kathy Knight and Dr. Anne Bomba. The subjects of this study were directors of 535 child care facilities in Mississippi. To create the sample group, a list was created with the 1526 licensed child care facilities in the state of Mississippi. A sample size formula was calculated to determine the sample size necessary for a 95% confidence interval (Suresh, 2011). The Andrew Hedges random number generator, a sample of 535 numbers was applied to the list of child care centers. The checklist packet contained an introductory letter, the consent form informing the facilities of the purpose of the research, and a CACFP Best Practices Checklist (Appendix). The introductory letter requested that the participants anonymously mail back the completed checklist, in addition to a sample cycle menu from the facility. A pre-addressed, stamped envelope was provided to the centers to encourage return. The directors were requested to black-out the name of the facility if it appeared on the menu, in order to maintain anonymity.

Survey Development

The survey was adapted from the Institute of Child Nutrition's (ICN) *Steps to Nutrition Success Checklist for Childcare Centers* which centered around the CACFP

best practices. Twenty-one out of the original forty questions were selected for this study, as they pertain mainly to the menu component of CACFP Best Practices. The CACFP Best Practices survey asked participants to rate different their knowledge and/or implementation of various aspects of nutrition, food service practices, and adherence to food safety and nutritional guidelines. The participants ranked their answers as "Skilled" if they were already doing a Best Practice well, "Some" if they have started working on a Best Practice, but need more training, "Maybe" if they might work on a Best Practice in the future, but need more training on how to begin and "NA" (Not Applicable) if they do not think the Best Practice is something they need to be doing. The survey was designed to evaluate the director's knowledge of CACFP Best Practices and providing nutritious meals for children.

Menu Data Analysis

The survey was distributed to 535 of the 1526 Mississippi child care centers that participate in the CACFP. The overall response rate was 10.1%, with 54 completing the survey and 35 including a sample menu.

The menus were checked for compliance with the CACFP food component requirements (found in Table 1). Nutrient content of the sample menus was analyzed using the NutriKids software with access provided by the Institution of Childhood Nutrition (LunchByte Systems NutriKids Menu Planning and Analysis Software, Version 17). If a facility sent a menu spanning multiple weeks, the first week was selected to give a constant amount of data for each facility. To make sure the foods were analyzed consistently, a standardization process was followed. If a certain food such as "spaghetti"

appeared on one menu, the same recipe was used for all menus that "spaghetti" was found on. The recipes were pre-loaded into the NutriKids Software and were from the USDA database. If a recipe was not found in the software, it was found on the USDA recipe database and input into the system. Child care centers participating in CACFP in Mississippi use Mississippi Recipes for Success, which are based on the USDA recipes. The serving sizes were based on the CACFP's guidelines for minimum portion sizes for children ages 3-5, and are found in Table 1. The amount of nutrients to provide 1/3 of the children's daily requirement based on the RDA is found in Table 2 from the DGA.

The results of the menu analysis were compared with 1/3 of the RDA values for children ages 3-5, found in Table 3. For both males and females aged 3-5, the caloric needs according to DGA vary from 1,000 to 1,600 calories daily based on activity levels ranging from sedentary to active (U.S. Department of Health and Human Services, & U.S. Department of Agriculture, 2015). For this study, the caloric needs of a moderately active child aged 3-5 was used as the standard, which is 1,400 calories per day. The DGA used for this study are the averages suggested for males and females aged 4-8, as this most closely related to the population of this study.

Table 1: CACFP Five Food Components with Minimum Quantity Allowances for Lunch and Supper Meals in Children Ages 3-5

Food Components	*Minimum Quantity*
Fluid Milk	6 fluid ounces
Meats/meat alternates	
Lean meat, poultry, or fish	1 ½ ounce
Tofu, soy products, or alternate protein products	1 ½ ounce
Cheese	1 ½ ounce
Large egg	¾
Cooked dry beans or peas	3/8 cup
Peanut butter or soy nut butter or other nut or seed butter	3 Tbsp.
Yogurt, plain or flavored, unsweetened or sweetened	6 ounces or ¾ cup
Peanuts, soy nuts, tree nuts, or seeds	¾ ounce
Vegetables	¼ cup
Fruits	¼ cup
Grains	
Whole grain-rich or enriched bread	½ slice
Whole grain-rich or enriched bread product, such as biscuit, roll, muffin	½ serving
Whole grain-rich, enriched, or fortified cooked breakfast cereal, cereal grain, and/or pasta	¼ cup

Source: Child and Adult Care Food Program: Meal Pattern Revisions Related to the Healthy, Hunger-Free Kids Act of 2010, 2016

Results

Menu Analysis

The mean nutrient content was calculated for each menu and compared to the DGA recommendations, found in Table 2. The analysis revealed that the menus were high in total grams of carbohydrates at an average of 63.8, but the percent of calories from carbohydrates was within the range of 45-65%, as set by DGA. Percent of calories from sugar was 17.5%, which was higher than the recommendation of <10%. The amount of grams of protein per menu was higher than the recommendation at 28.1 grams, but fell within the range for percent of calories from protein of 10-30%. Sodium content was also higher than the recommendation at 763.8 milligrams. However, when examining the ranges of the nutrient contents of the menus, it is evident that many centers could benefit from lowering the amount of calories, sodium content, and carbohydrate content.

The results of the nutrient means from the current study were compared to those from the Oakley et al. study completed in 1995. These results are found in Table 4 and Figure 1. Means from current data were compared to means from Oakley et al. using a T-test, shown in Table 5. This showed that both total and saturated fat were significantly lower in the current study when compared to the study completed in 1995. Iron, calcium, vitamin C, vitamin A, fiber and total calories were all significantly higher in the current study as compared to Oakley et al.

Table 2: Comparison of Daily Nutritional Goals Based on Dietary Reference Intakes and Dietary Guidelines for American's Recommendations, for males and females ages 4-8 for one meal, with Nutrient Content of Menus

Nutrient data	*Recommendation*	*Average from Study*
Calories	466	497.8 (*SD*=76.6)
Total fat (g)	12 - 18	15 (*SD*=3.7)
% of Calories from fat	25-35%	27(SD=4.4)
Saturated fat (g)	5	5.5(SD=1.4)
% of Calories from Sat. Fat	<10%	10(SD=2.0)
Carbohydrate (g)	43.29	63.8(SD=12.0)
% of Calories from Carb.	45%-65%	51.3(SD=4.7)
Fiber (g)	6.06	5.7(S=1.3)
% of Calories from Sugar	< 10%	17.5(SD=3.1)
Protein (g)	6.327	28.1(SD=3.2)
% of Calories from Protein	10%-30%	22.8(SD=2.0)
Iron (mg)	3.33	3.2(SD=0.5)
Calcium (mg)	333	459.9(SD=60.7)
Vitamin A (µg)	133.2	4140.1(SD=2188.4)
Vitamin C (mg)	8.325	29.1(SD=23.0)
Sodium	632.7	763.8(SD=154.7)

Source: U.S. Department of Health and Human Services, & U.S. Department of Agriculture, 2015.

Table 3: Nutrient Quality Ranges of Menus in Mississippi Child Care Centers

Nutrient Data	*Range*
Calories	359-640
Total Fat (g)	6.29-24.06
% of Calories from fat	15.75-38.42
Saturated Fat (g)	1.82-8.43
% of Calories from Sat. Fat	4.55-14.75
Cholesterol (mg)	32-83
Sodium (mg)	465-1172
Carbohydrate (g)	42.62-91.03
% of Calories from Carb.	39.94-62.72
Fiber (g)	3.4-8.88
Sugars (g)	15-28
% of Calories from Sugar	10.03-25.27
Protein (g)	21.13-34.18
% of Calories from Protein	18.04-27.32
Iron (mg)	2.23-4.45
Calcium (mg)	375-616.88
Vitamin A (IU)	885-10149
Vitamin C (mg)	10.75-107.02

Figure 1: Comparison of Nutrient Content of Menus in 1995 and 2018 with Current Dietary Guideline Recommendations

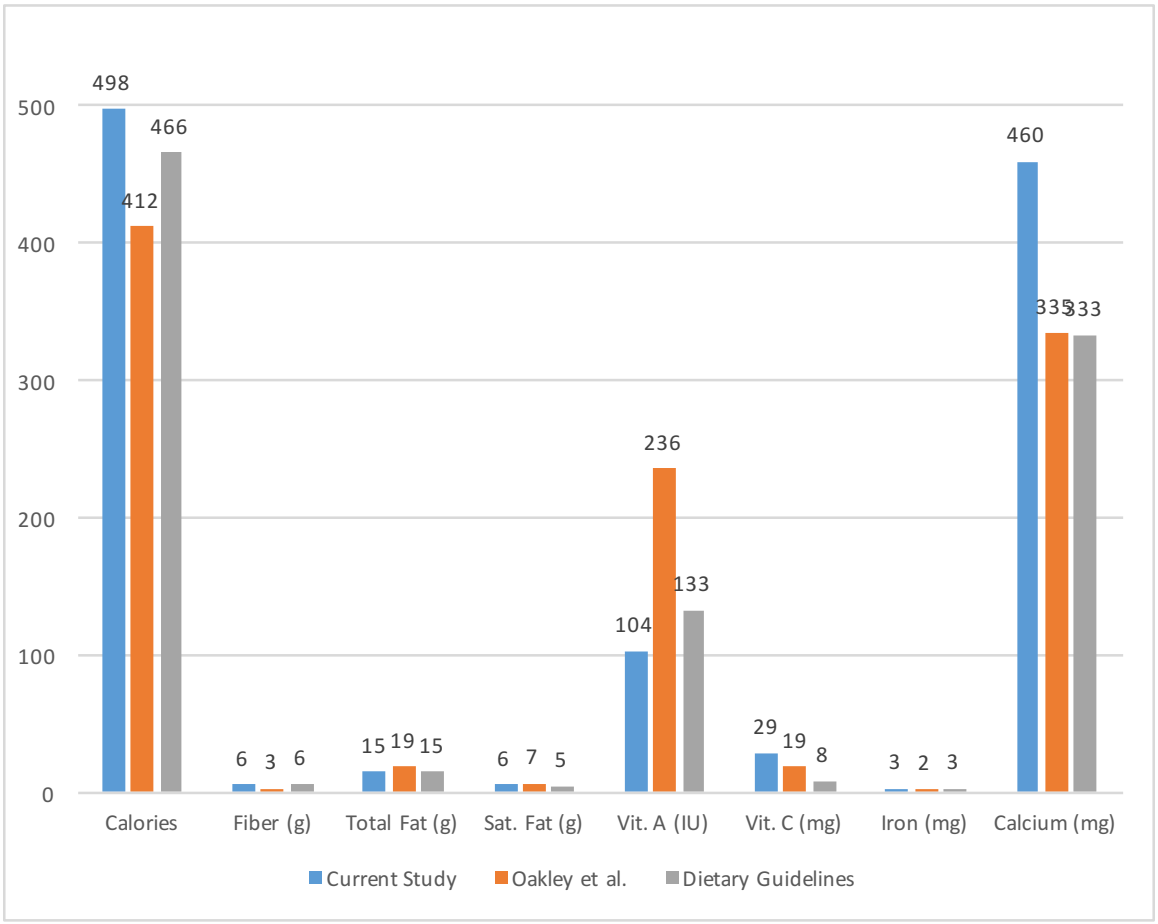

Table 4: Means, Standard Deviations and Probabilities of a larger t for Total Fat, Saturated Fat, Fiber, Calories, Calcium Iron, Vitamin A and Vitamin C

	Current Study	*Oakley et al. 1995*	*P=<*
Total Fat (g)	15.05(SD=3.66)	19.00(SD=6.00)	0.00
Sat. Fat (g)	5.54(SD=1.40)	7.00(SD=3.00)	0.00
Vit. A (µg)	1242.00(SD=656)	236.00(SD=253.00)	0.00
Vit. C (mg)	29.07(SD=23.03)	19(SD=13.00)	0.02
Iron (mg)	3.22(SD=0.53)	2.40(SD=0.97)	0.00
Calcium (mg)	459.92(SD=60.74)	335.00(SD=72.00)	0.00
Total Calories (kcal)	497.82(SD=76.55)	412.00(SD=100.00)	0.00
Fiber (g)	5.72(SD=1.32)	3.10(SD=1.70)	0.00

*All means were significantly different from one another.

Survey Analysis

The survey were analyzed for how many participants selected each of the options for the Best Practices of the CACFP. If a facility selected “skilled,” they answered that they are already doing a best practice; if a participant selected “some,” they answered that they have started working on a best practice; when “maybe” was selected, this meant that the participants might work on a best practice in the future with training on how to begin; if the participant did not think the best practice was needed, they chose “not applicable.” The questions that were considered of interest were those that had large percentages answering either “some” or “maybe.”

When asked how participants felt regarding planning nutrition activities to help children accept new foods, 24% (n=13)felt that they would practice this more with additional training. Similarly, 37% (n=20) of participants felt that if they had more training, they would involve parents in promoting new menus and foods offered at the center. These two questions focused on the menu planning process of introducing children to new foods. When asked about planning meals that contain the correct amount of calories and fat, 13% (n=7) of participants said they would practice this in the future with more training, while 33% (n=18) said they have started practicing this, but are not considered skilled. These results indicate that the menu planners should be given additional training in order to provide menus with adequate nutrition for children at the centers. Additionally, when asked more in-depth questions about planning menus with whole grains and fruits and vegetables for plenty of fiber, 22% (n=12) indicated they need additional training in order to practice this. In regards to planning meals and snacks with low sodium and sugar, 24% (n=13) of participants stated they would need more training to fulfill this best practice. When asked whether the planned meals include a wide variety of foods, especially fruits and vegetables, 30% (n=16) said they would not consider themselves skilled.

Table 5: Best Practices Survey Responses

Best Practice	Skilled	Some	Maybe	NA	Unanswered
1. Use the nutrition requirements of the CACFP, Head Start, or licensure to ensure that the food and nutrition needs of the children are met.	82%	16%	15%	0%	2%
5. Serving meals and snacks so that all foods are at their peak of freshness and quality is at its best.	79%	19%	2%	0%	0%
6. Noting children's food choices/preferences and incorporating them into the menu.	49%	37%	9%	4%	2%
7. Planning nutrition education activities to help children accept new foods.	33%	37%	25%	5%	0%
8. Involving parents in promoting new menus and foods offered in the childcare center.	5%	47%	39%	9%	0%
9. Planning menus that consider the ethnic and cultural backgrounds of the children.	30%	33%	25%	9%	4%
10. Planning cycle menus.	68%	23%	4%	0%	5%
11. Using standardized recipes to assure the right amount of food is prepared and healthy food preparation methods are used.	56%	32%	9%	4%	0%
12. Preparing foods using healthy cooking methods such as steaming instead of boiling and roasting or grilling instead of frying.	72%	23%	2%	2%	2%
22. Planning menus to meet the CACFP meal pattern requirements for meals and snacks.	77%	12%	2%	2%	7%
24. Making appropriate menu substitutions when necessary.	67%	23%	2%	0%	9%
25. Serving required amounts of food at meals and snacks.	72%	18%	2%	0%	9%
26. Planning meals to include foods rich in Vitamins A and C (fruits and vegetables), iron (meat, poultry, green vegetables and enriched breads and cereals), and calcium (milk, cheese, yogurt, and fortified orange juice).	77%	12%	2%	0%	9%
27. Planning meals and snacks that provide the right amounts of calories and fat.	44%	33%	14%	2%	7%
28. Planning meals and snacks to include whole grains and fruits and vegetables for plenty of fiber.	65%	23%	5%	0%	7%
29. Planning meals and snacks that are low in sodium and sugar.	60%	25%	7%	2%	7%
30. Planning menus around a wide variety to foods, especially fruits and vegetables.	63%	30%	0%	0%	7%
31. Children can decide how much to eat from the foods offered, and are allowed to decline unwanted foods.	60%	21%	4%	7%	9%
32. Meals and snacks include foods familiar o children and consistent with the cultures represented in the center.	60%	25%	5%	4%	7%
40. Snacks provided by the facility promote healthy eating habits.	68%	18%	5%	2%	7%

Discussion

Most childcare centers provide breakfast, lunch and a snack for enrolled children, which according to the CACFP guidelines, makes them responsible for two-thirds of the children's daily nutrient intake. This allows childcare facilities the unique responsibility of influencing children's meal patterns and preferences (Laughlin, 2013). CACFP recognizes the importance of high-quality nutritional meals, and reimburses participating childcare facilities and schools for providing nutritious meals.

This study analyzed 35 menus from childcare centers across the state of Mississippi who are enrolled in CACFP. One limitation to the study is the small sample size and response rate. This could be due to the lack of incentive to participate for the child care centers other than to aid in research. Additionally, since the study was conducted anonymously, it may be difficult to generalize the results as representative as the state of Mississippi as a whole since there is no information as to if the chosen centers were evenly distributed among the state.

Based on the results of the menu analysis compared to the study by Oakley et. al in 1995, many centers have created menus which reflect DGA recommendations. The amounts of fiber, Vitamin A, Vitamin C, iron and calcium have all increased significantly since the 1995 study. Additionally, the amount of total fat and saturated fat in Mississippi child care centers' menus have decreased in recent years (Oakley et. al, 1995). This could be due largely to the amended guidelines that CACFP introduced in 2017 (Andreyeva & Henderson, 2018; Hayes et al., 2018). While the average amount of calories reported was

higher in the current study than both Oakley et. al in 1995 and the DGA recommendations, the range revealed that the majority of centers were meeting the requirement. In addition, the slightly higher amount of average calories could be due largely to the requirement of the five food components. The child care centers have to monitor the menus to meet the five food components, which could have caused an increase in average calories.

CACFP observes participating child care centers through requiring five food components at each meal, but not through the requirement of an analyzed menu for nutrient content for each meal (U.S. Department of Health and Human Services & U.S. Department of Agriculture, 2015). While this study looked at the nutrient content of the menus based on DGA recommendations, it did not look at if the centers were meeting each of the five components for CACFP.

The survey statistics provided additional information about how the child care center menus are planned. Many facilities indicated that they needed additional training in order to provide adequate nutrition. Most facilities did not consider themselves skilled at providing menus that included adequate calories, fat percentages, variety of fruits and vegetables, and were low in sodium and sugar. The survey also indicated that the directors were not skilled in planning menus that promoted the acceptance of new foods.

Another important consideration is including parents in incorporating new and healthy foods in children's diets at home. Parents have been shown to have a positive impact on developing children's eating patterns, and should be encouraged to introduce healthy options to children (Lehto, Ray, Vespalainen, Korkalo, Nissinen, Skaffari, … Erkkola, 2019). Additionally, since many children in America participate in some form of

childcare outside of the home, the nutrition content of child care center's menus should be researched more in depth (Organization for Economic Cooperation and Development, 2016). The staff members at these child care centers are responsible for modeling positive behaviors and eating patterns for children while at an instrumental time in their development (Ray, Maatta, Lehto, Roos, & Roos, 2016).

Conclusions

The purpose of this study was to evaluate the menus of Mississippi child care centers for nutrient content and adherence to CACFP standards and best practices. The results of this study showed that changes in CACFP regulations may have impacted menus in child care centers in Mississippi.

When compared with results from the Oakley et al. study conducted in 1995, recent changes to CACFP guidelines may have helped decrease the amounts of added sugars, sodium and total fat in meals served in child care centers. Additional child care centers in Mississippi should be encouraged to participate in CACFP, as this could help ensure all children are receiving adequate nutrition on a daily basis. CACFP can play an instrumental role in helping prevent childhood obesity through providing healthy meals to children and educating caregivers in healthy eating patterns. While the creation of the Healthy, Hunger-Free Kids Act and implementation of new USDA nutrition standards have helped introduce additional healthier options to school lunch programs, more research could be beneficial in improving overall nutritional quality of meals in child care settings.

List of References

Andreyeva, T., & Henderson, K. E. (2018). Center-reported adherence to nutrition standards of the Child and Adult Care Food Program. *Childhood Obesity*, *14(6),* 421-428. doi:10.1089/chi.2018.0076

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, N.J.: Prentice-Hall.

Brunner, T., Horst, van der, K. & Siegrist, M. (2010), Convenience food products. Drivers of consumption, *Appetite*, *55 (3),* 498-506.

Centers for Disease Control and Prevention. (2012). Overweight and Obesity. National Center for Chronic Disease Prevention and Health Promotion, Atlanta, GA.

Child and Adult Care Food Program: Meal Pattern Revisions Related to the Healthy, Hunger-Free Kids Act of 2010; Final Rule, 81 Fed. Reg. 24367 (April 25, 2016) (to be codified at 7 CFR pt. 210, 215, 220, & 226).

Concannon, K. (2017). *USDA announces effort to strengthen nutrition among young children, create healthy habits early*. United States, Department of Agriculture, Food and Nutrition Service, Chief Communications Officer.

Dev, D. A., Mcbride, B. A., Speirs, K. E., Donovan, S. M., & Cho, H. K. (2014). Predictors of Head Start and child-care providers healthful and controlling feeding practices with children aged 2 to 5 years. *Journal of the Academy of Nutrition and Dietetics, 114*(9), 1396-1403. doi:10.1016/j.jand.2014.01.006

Erinosho, T., Dixon, L. B., Young, C., Brotman, L. M., & Hayman, L. L. (2011). Nutrition practices and children's dietary intakes at 40 child-care centers in New York City. *Journal of the American Dietetic Association, 111*(9), 1391-1397. doi:10.1016/j.jada.2011.06.001

Erinosho, T., Vaughn, A., Hales, D., Mazzucca, S., Gizlice, Z., Treadway, C., & Ward, D. (2018). The quality of nutrition and physical activity environments of child-care centers across three states in the southern U.S. *Preventive Medicine,113*, 95-101. doi:10.1016/j.ypmed.2018.04.029

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

Gray, V. B., Byrd, S. H., Fountain, B. J., Rader, N. E., & Frugé, A. D. (2015). Childhood nutrition in the Mississippi Delta: Challenges and opportunities. *Health Promotion International*. doi:10.1093/heapro/dav072

Hannon, P.A., Bowen, D.J., Moinpour, C.M. & McLerran, D.F. (2003). Correlations in perceived food use between the family food preparer and their spouses and children, *Appetite*, *40*(1), 77-83.

Harbaugh, B. L., Bounds, W., Kolbo, J., Molaison, E., & Zhang, L. (2009). Prevalence estimates of overweight in Head Start preschoolers. *Journal of Pediatric Nursing, 24*(5), 350-359. doi:10.1016/j.pedn.2008.05.001

Hayes, D., Contento, I. R., & Weekly, C. (2018). Position of the Academy of Nutrition and Dietetics, Society for Nutrition Education and Behavior, and School Nutrition Association: Comprehensive nutrition programs and services in schools. *Journal of the Academy of Nutrition and Dietetics,118*(5), 913-919. doi:10.1016/j.jand.2018.03.005

Head Start Program, 60 Fed. Reg. 31612 (June 15, 1995) (to be codified at 45 CFR pt. 1310).

Hirsch, T., Lim, C., & Otten, J. J. (2016). What's for Lunch?: A socio-ecological approach to childcare nutrition. *Conference on Designing Interactive Systems,*1160-1171.

Kaphingst, K. M., & Story, M. (2008). Child care as an untapped setting for obesity prevention: State child care licensing regulations related to nutrition, physical activity, and media use for preschool-aged children in the United States. *Preventing chronic disease*, *6*(1), A11.

Kazaks, A.G., & J.S. Stern. 2013. *Nutrition and obesity: Assessment, management, and prevention*. Burlington, MA: Jones & Bartlett Learning.

Laughlin, L. L. (2013). *Who's minding the kids?: Child care arrangements: Spring 2011*. (Current Population Reports, P70-135). Washington, DC: U.S. Bureau of the Census.

Lehto, R., Ray, C., Vepsäläinen, H., Korkalo, L., Nissinen, K., Skaffari, E., . . . Erkkola, M. (2019). Early educators' practices and opinions in relation to pre-schoolers' dietary intake at pre-school: Case Finland. *Public Health Nutrition*, 1-9. doi:10.1017/s1368980019000077

Monteiro, C.A., Moubarac, J.C., Cannon, G., Ng, S.W. and Popkin, B. (2013), Ultra-processed products are becoming dominant in the global food system. *Obesity Reviews*, *14*(S2), 21-28.

Nutrikids: Nutritional analysis (Version 17) [Computer software]. (2016). Rochester, NY: Heartland Payment Systems.

Neel, J.V. (1962). Diabetes mellitus: A ‘thrifty’ genotype rendered detrimental by ‘progress’? *American Journal of Human Genetics*, *14*(4), 353– 62.

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

Nguyen, V.T., Larson, D.E., Johnson, R.K. and Goran, M.I. (1996). Fat intake and adiposity in children of lean and obese parents. *The American Journal of Clinical Nutrition, 63*(4), 507– 13.

Oakley, C. B., Bomba, A. K., Knight, K. B., & Byrd, S. H. (1995). Evaluation of menus planned in Mississippi child-care centers participating in the Child and Adult Care Food Program. *Journal of the American Dietetic Association,95*(7), 765-768. doi:10.1016/s0002-8223(95)00213-8

Organization for Economic Cooperation and Development, Social Policy Division, Directorate of Employment, Labor and Social Affairs (2016) *Enrollment in childcare and pre-school,* [PDF].

Ray, C., Määttä, S., Lehto, R., Roos, G., & Roos, E. (2016). Influencing factors of children’s fruit, vegetable and sugar-enriched food intake in a Finnish preschool setting – Preschool personnels perceptions. *Appetite*, *103*, 72-79. doi:10.1016/j.appet.2016.03.020

Rice, K. R., & Trost, S.G. (2014). Physical activity levels among children attending family day care. *Journal of Nutrition Education and Behavior. 46*(3), 197-202.

Savage, J. S., Fisher, J. O., & Birch, L. L. (2007). Parental influence on eating behavior:

Conception to adolescence. *The Journal of Law, Medicine & Ethics,35*(1), 22-34. doi:10.1111/j.1748-720x.2007.00111.x

Stutts, L. (2017). *Childhood and adolescent obesity*. New York, NY: Momentum Press.

U.S. Department of Health and Human Services. Healthy people 2020: Understanding and improving health and objectives for improving health. Washington, DC, U.S. Govt Printing Office, 2010.

U.S. Department of Health and Human Services, & U.S. Department of Agriculture. (2015). Estimated calorie needs per day, by age, sex, and physical activity level. *Dietary Guidelines for Americans 2015-2020,8*, 75-78.

U.S. Department of Health and Human Services, & U.S. Department of Agriculture. (2015). USDA food patterns: Healthy U.S.-style eating pattern. *Dietary Guidelines for Americans 2015-2020,8*, 79-82.

Watt, T. T., Appel, L., Lopez, V., & Flores, B. (2015). A primary care-based early childhood nutrition intervention: Evaluation of a pilot program serving low-income Hispanic women. *Journal of Racial and Ethnic Health Disparities*, *2*(4), 537-547. doi:10.1007/s40615-015-0102-2

Appendix

Letter to Director

July 23, 2018

Dear Director,

As you well know, running a food service for childcare is not easy. We at the University of Mississippi are trying to develop good educational materials for childcare food service directors and works, but we need your help.

Could you please fill out the enclosed consent form and survey and then send them back to us, along with a copy of your cycle menus? We would really appreciate it, and it would help us know what we need to do to develop the kind of training that will really help you to do your jobs better.

Thank you so much for your help.

Sincerely,

Kathy B. Knight, PhD, RD, LD
Associate Professor

Study: Review of Menus & Production Activities in Mississippi Child Care Facilities

Investigator
Kathy B. Knight
Department of Nutrition and Hospitality Management
University of Mississippi
University, MS 38677
(662) 915-5172
kknight@olemiss.edu

☐ By checking this box I certify that I am 18 years of age or older.

The purpose of this study is to review cycle menus and details about food production in Mississippi child care centers in order to help us design training that will help food service directors and workers do their jobs better.
If you agree to participate, we would ask that you please:

1. Fill out the enclosed survey of questions about the preparation of food in your food facility.
2. Out this consent form, the completed survey, and a copy of your cycle menus in the enclosed stamped, return-addressed envelope and mail it to us.
3. Please do not put your name or the name of your facility on the survey or the cycle menus.

This will take about 1 hour of your time.

Possible risks and benefits from your participation.

We do not anticipate any risks associated with your participation in this study. You will also not receive any benefits. However, you might experience satisfaction from contributing to knowledge that may improve training for childcare facilities. Also, answering the survey questions might make you more aware of things that you would like to change or continue – sometimes this can help lead to improved food production.

Confidentiality
All information in the study will be collected from you anonymously: it will not be possible for anyone, even the researchers, to associate you or your facility with your responses.

Right to Withdraw
You do not have to participate, and there is no penalty if you refuse. You also do not have to answer any questions that you prefer not to answer.

IRB Approval
This study has been reviewed by The University of Mississippi's Institutional Review Board (IRB). If you have any questions, concerns, or reports regarding your rights as a participant of research, please contact the IRB at (662) 915-7482 or irb@olemiss.edu.

Statement of Consent
I have read and understand the above information. By completing the survey/interview I consent to participate in the stud

CACFP Best Practice Checklist

(Adapted from the Institute of Child Nutrition's Steps to Nutrition Success Checklist for Childcare Centers)

Please rate your knowledge of each of the Best Practices below. Check "Skilled" if you are already doing a Best Practice well. Check "Some" if you have started working on a Best Practice, but need more training. Check "Maybe" if you might work on a Best Practice in the future, but need more training on how to begin. Check "NA" (Not Applicable) if you do not think the Best Practice is something you need to be doing.

Best Practices	**Skilled**	**Some**	**Maybe**	**NA**
1. Use the nutrition requirements of the CACFP, Head Start, or licensure to ensure that the food and nutrition needs of the children are met.				
2. Writing food and nutrition procedures for feeding children with special needs.				
3. Completing daily food production records.				
4. Developing work schedules for food preparation employees.				
5. Serving meals and snacks so that all foods are at their peak of freshness and quality is at its best.				
6. Noting children's food choices/preferences and incorporating them into the menu.				
7. Planning nutrition education activities to help children accept new foods.				
8. Involving parents in promoting new menus and foods offered in the childcare center.				
9. Planning menus that consider the ethnic and cultural backgrounds of the children.				
10. Planning cycle menus.				
11. Using standardized recipes to ensure the right amount of food is prepared and healthy food preparation methods are used.				
12. Preparing foods using healthy cooking methods such as steaming instead of boiling and roasting or grilling instead of frying.				
13. Using the *Food Buying Guide for Child Nutrition Programs* to determine the amounts of food to purchase.				
14. Creating a clean, pleasant place for children to eat.				
15. Arranging tables and seating areas to encourage conversation among children and with teachers.				
16. Encouraging caregivers to sit with and eat the same meals and snacks as the children.				
17. Giving children enough time to eat without hurrying.				

18. Providing the right amount of assistance to children during mealtime.				
19. All food safety and health regulations, licensure registration, or other rules are followed.				
20. Training all child care program staff members in proper hand washing and food safety procedures.				
21. Planning menus to meet the CACFP meal pattern requirements for meals and snacks.				
22. Making appropriate menu substitutions when necessary.				
23. Serving required amounts of food at meals and snacks.				
24. Planning meals to include foods rich in Vitamins A and C (fruits and vegetables), iron (meat, poultry, green vegetables and enriched breads and cereals), and calcium (milk, cheese, yogurt, and fortified orange juice).				
25. Planning meals and snacks that provide the right amounts of calories and fat.				
26. Planning meals and snacks to include whole grains and fruits and vegetables for plenty of fiber.				
27. Planning meals and snacks that are low in sodium and sugar.				
28. Planning menus around a wide variety of foods, especially fruits and vegetables.				
29. Children can decide how much to eat from the foods offered, and are allowed to decline unwanted foods.				
30. Meals and snacks include foods familiar to children and consistent with the cultures represented in the center.				
31. Special nutrition needs are based on written recommendations of a recognized medical authority.				
32. Menus are adapted to meet the nutrition and feeding needs of children.				
33. A plan is in place for obtaining the services of a registered dietitian for consultation on diet orders when meals are to be modified.				
34. Children with special needs are included in mealtime activities as much as possible.				
35. Nutrition education is provided as a component of the comprehensive child care curriculum.				
36. Current age-appropriate nutrition education materials readily accessible to child care teachers.				
37. The child care program staff facilitates pleasant conversation at mealtimes related to the foods				

served, tell stories, and use other activities that teach children about healthy foods.				
38. Snacks provided by the facility promote healthy eating habits.				