



Short Communication

The impact of replacing breakfast grains with meat/meat alternatives: an evaluation of child nutrition policy

Jennifer A Hanson^{1,*}, Olivia Cantrell¹, Paola Paez², Priscilla Brenes¹ and Denise E Laursen³

¹Department of Food, Nutrition, Dietetics and Health, Kansas State University, 212 Justin Hall, 1324 Lovers Lane, Manhattan, KS 66506, USA: ²The Center for Food Safety in Child Nutrition Programs, Kansas State University, Manhattan, KS, USA: ³Department of the Army, Installation Management Command, G9-Child and Youth Services, Joint Base San Antonio–Fort Sam Houston, San Antonio, TX, USA

Submitted 29 January 2019: Final revision received 14 August 2019: Accepted 27 August 2019: First published online 4 February 2020

Abstract

Objective: To evaluate the Child and Adult Care Food Program (CACFP) rule that allows a meat/meat alternative to replace the breakfast grain requirement three times per week.

Design: A 5-week menu including breakfast, lunch and snack was developed with meat/meat alternative replacing the breakfast grain requirement three times per week. Menu nutrients based on the minimum requirements were compared with reference values representing the Acceptable Macronutrient Distribution Range for fat and a range of reference values representing two-thirds the Dietary Reference Intake for 3-year-olds and 4–5-year-olds. The meal pattern minimum requirements were compared with two-thirds of those recommended by the Dietary Guidelines for Americans (DGA).

Setting: Evaluation took place between April and June 2019.

Participants: Human subjects were not utilized.

Results: The CACFP minimum grain requirement is well below the DGA reference value (0.5–1.5 v. 3.33 ounce-equivalents). Energy (2208.52 kJ) was below the reference values (3126.83–4362.53 kJ). Protein (34.43 g) was above the reference values (9.87–10.81 g). Carbohydrate (76.65 g), fibre (7.46 g) and vitamin E (1.69 mg) were below their reference values of 86.67 g, 10.46–14.60 g and 4–4.76 mg, respectively. Fat (22.57 %) was below the reference range (25–40 %).

Conclusions: The CACFP rule which allows a meat/meat alternative to replace the breakfast grain requirement three times per week may result in meal patterns low in energy, carbohydrate, fat, fibre and vitamin E, while providing an excessive amount of protein.

Keywords
Childcare
Nutrition policy
Dietary protein
Macronutrients
Vitamin E

The Child and Adult Care Food Program (CACFP), a nutrition assistance programme administered by the US Department of Agriculture's Food and Nutrition Service, serves more than 4.2 million children each day⁽¹⁾. Under the programme, childcare centres and childcare homes receive reimbursement for eligible meals and snacks. In order to qualify for reimbursement, meals and snacks must meet the CACFP meal pattern requirements, which specify minimum amounts for the various meal components, such as vegetables and grains, based on the age of the child and

the meal served (e.g. breakfast, lunch, snack)⁽²⁾. The programme's meal pattern requirements were updated in April 2016 and implementation of the new requirements began on 1 October 2017⁽³⁾. As required by the Healthy, Hunger-Free Kids Act of 2010, the updates were designed with the goal of reflecting the Dietary Guidelines for Americans (DGA)⁽⁴⁾.

The updates were the first major change to the meal pattern requirements since the programme was established in 1968⁽³⁾. Under the new rules, centres and daycare homes

*Corresponding author: Email jhanson2@ksu.edu



participating in the CACFP are required to limit the service of juice to no more than once per day, to make at least one serving of grains per day wholegrain-rich, and to serve foods (e.g. yoghurt, breakfast cereal) with less added sugar. Because grain-based desserts (e.g. cookies, brownies) have been identified by the DGA⁽⁴⁾ as sources of added sugar and saturated fat in the diets of US children, they can no longer be used to fulfil the grain requirement under the new rule⁽³⁾. However, meat/meat alternatives may now be served in place of the grain component at breakfast up to three times per week. The meat/meat alternative component includes meat, fish, poultry, yoghurt, cheese, dry beans and peas, whole eggs, alternative protein products, nut and seed butters, and nuts and seeds⁽³⁾. In addition to updating the meal pattern requirements, the new CACFP rules address optional best practices that are intended to guide centres and daycare homes desiring to improve the nutritional value of meals beyond what is required.

In developing the new meal patterns, the Food and Nutrition Service commissioned the National Academy of Medicine (NAM) to provide recommendations that would align the meal patterns with the DGA. Using the NAM recommendations⁽⁵⁾, as well as the DGA and stakeholder input, the Food and Nutrition Service developed and published its proposed rule changes⁽³⁾. Prior to finalizing the meal pattern changes, the Food and Nutrition Service reviewed the comments from a wide array of stakeholders including health-care associations, food industry representatives, CACFP-sponsoring organizations and providers, state agencies, nutritionists and parents⁽³⁾. However, an evaluation of the impact of these changes with regard to the nutrient content of the menus created in accordance with the new rules has not been published in the research literature.

Although few studies have analysed the nutrient content of childcare centre menus and compared the results with the Dietary Reference Intakes (DRI)^(6,7), an analysis of lunch menus collected in 2012 revealed that the menus supplied inadequate amounts of carbohydrate and fibre while supplying excessive amounts of protein⁽⁸⁾. While this earlier menu analysis did not include information regarding what was actually consumed, the meals served in these settings are nevertheless a concern because the nutritional quality of the food consumed in childcare settings has been shown to be highly associated with that of the food served in such settings⁽⁹⁾. As a result of the new CACFP option which allows the breakfast grain component to be replaced by meat/meat alternatives, menus based on the implementation of this option will likely exhibit an even greater macronutrient imbalance than that which has already been demonstrated⁽⁸⁾.

The objective of the present project was to assess the potential impact of the updated CACFP rule that allows a meat/meat alternative to replace the breakfast grain requirement up to three times per week. To test the parameters of this rule, an evaluation was conducted by creating a

simulated menu to operationalize the new rule. The evaluation was accomplished by: (i) comparing the nutrient content of the simulated menu with the DRI^(6,7); (ii) comparing the allowable meal pattern with the Healthy US Style Eating Pattern recommended by the DGA⁽⁴⁾; and (iii) comparing the allowable meal pattern with the meal pattern recommended in the NAM report⁽⁵⁾.

Methods

A simulated 5-week menu including breakfast, lunch and afternoon snack was created based on the CACFP meal pattern requirements for 3–5-year-old children (Fig. 1). The simulated menu, which was created by a registered dietitian with a PhD and 4 years of experience with developing CACFP-compliant menus, was based on foods and recipes that are creditable by CACFP, acceptable, achievable and reasonably available. The simulated menu was developed for implementation in the summer and therefore the foods incorporated in the menu were those typically available during the summer months in most locations within the USA. Meat/meat alternatives were used in place of the breakfast grain component three times per week. Most lunch entrées were menu items designed to be prepared from recipes. Skimmed milk was used to fulfil the milk component requirement. The full 5-week simulated menu is included as online supplementary material.

Nutrient analysis was powered by the ESHA Research Nutrient Database©. To achieve consistency and accuracy in the entering of foods into the database, a codebook was developed by the PhD registered dietitian for commonly listed foods such as the fruits, vegetables and grains (e.g. saltine crackers). Condiments including mustard, mayonnaise and pancake syrup were included in the analysis. For mixed dishes such as sandwiches, the nutrient analysis was based upon CACFP-creditable recipes. In such instances, the portion size for one or more components was sometimes greater than the minimum meal pattern requirements. For example, the turkey pita sandwich recipe used in the current analysis meets the meat/meat alternative minimum requirement, but it provides three times the grain minimum requirement. For foods not based on a mixed dish recipe, the quantity of each food entered was determined based on the minimum serving needed to fulfil the CACFP requirement. For ready-to-eat breakfast cereals, the quantity entered was determined using the portion size rule in effect beginning 1 October 2019⁽³⁾.

Daily nutrient means were calculated for the simulated menu and compared with reference values representing two-thirds of the DRI. Two-thirds was selected as the DRI benchmark because children receiving full-time care may require this proportion of nutrient while in full-time care⁽¹⁰⁾. Because the CACFP 3–5-year-old age category spans two DRI age categories (i.e. 1–3-year-olds and 4–8-year-olds), comparisons were made with the DRI for

Week 1	Minimum serving size, 3–5-year-olds	Monday	Tuesday	Wednesday	Thursday	Friday
Breakfast						
Milk	¾ c (177 ml)	Skimmed milk	Skimmed milk	Skimmed milk	Skimmed milk	Skimmed milk
Fruit or Vegetable	½ c (118 ml)	Banana	Pineapple	Strawberries	Pears	Cantaloupe
Grain or Meat/Meat Alt	½ oz (14 g) equivalent	Yoghurt	Corn puffs cereal	Scrambled eggs	Ham	English muffin
Other						
Lunch		Spaghetti with Meat Sauce	Baked Chicken	Tuna Salad	Pinto Beans & Corn Bread	Turkey Chop Suey
Meat/Meat Alt	1 ½ oz (43 g)	Ground beef	Chicken	Tuna	Pinto beans	Turkey
Grain	½ oz (14 g) equivalent	WGR pasta	WGR roll	WGR crackers	WGR cornbread	Brown rice
Fruit or Vegetable	¾ c (59 ml)	Tomato paste in sauce	Pears	Cucumber salad	Watermelon	Applesauce
Vegetable	¾ c (59 ml)	Tossed salad	Green beans	Steamed carrots	Turnip greens	Peas
Milk	¾ c (177 ml)	Skimmed milk	Skimmed milk	Skimmed milk	Skimmed milk	Skimmed milk
Other						
Afternoon Snack		Italian salad dressing				
Fruit	½ c (118 ml)	Orange juice		Apple		
Vegetable	½ c (118 ml)				Marinara sauce and potato wedges	Cauliflower & broccoli
Meat/Meat Alt	½ oz (14 g) equivalent	Mozzarella cheese				
Grain	½ oz (14 g) equivalent		Graham crackers			WGR crackers
Milk	½ c (118 ml)		Skimmed milk	Skimmed milk	Skimmed milk	
Other						
						Creamy vegetable dip

Fig. 1 One-week sample menu based on the Child and Adult Care Food Program standards for 3–5-year-old children (Meat/Meat Alt, meat/meat alternative; c, cup; WGR, wholegrain-rich)

3-year-olds as well as with the DRI for 4–5-year-olds. For the 3-year-olds, energy reference values were determined using the mean values for the estimated energy requirements for 3-year-old boys and 3-year-old girls with physical activity levels ranging from sedentary to active. For the 4–5-year-olds, energy reference values were determined using the mean estimated energy requirements for 4-year-old-boys, 4-year-old girls, 5-year-old boys and 5-year-old girls with physical activity levels ranging from sedentary to active. Protein reference values were determined using the DRI (1.05 g/kg) and mean weight for the reference 3-year-old boy and reference 3-year-old girl. For the 4–5-year-olds, protein reference values were determined using the DRI (0.95 g/kg) and the mean weight for the reference 4-year-old boy, 4-year-old girl, 5-year-old boy and 5-year-old girl. The reference values for dietary fibre were determined by applying the DRI Adequate Intake for total fibre, 14 g/4184 kJ (14 g/1000 kcal), to the energy reference values. The Acceptable Macronutrient Distribution Range was used as the reference value for fat.

The estimated energy requirements for the full day range from 4518.72 kJ (1080 kcal) for a sedentary 3-year-old girl to 6937.07 kJ (1658 kcal) for an active 5-year-old boy⁽⁶⁾. Therefore, the 5857.60 kJ (1400 kcal) Healthy US

Style Eating Pattern from the DGA⁽⁴⁾ was used as the standard for comparison. In comparing the simulated CACFP meal patterns with the recommendations in the NAM report⁽⁵⁾, we selected the recommended daily meal patterns for 2–4-year-olds as the standard for comparison. An average daily range was determined based on the weekly recommendations for snacks and the option to serve 28.35 g (1 oz) of meat in place of 28.35 g (1 oz) of grain three times per week.

Means and standard deviations were calculated for the daily nutrient values using the statistical software package IBM SPSS Statistics version 25.0.

Results

The energy provided by the simulated menu ranges from 50.6 to 70.6 % of the reference values. The protein content exceeds the reference values, while carbohydrate, fibre, vitamin E contents and the percentage of energy from fat are below the reference values for both the 3-year-olds and the 4–5-year-olds. The Fe content is below the reference values for the 4–5-year-olds (Table 1).

**Table 1** Average daily nutrients provided by simulated 5-week menu for breakfast, lunch and afternoon snack based on Child and Adult Care Food Program guidelines with incorporation of the option to serve meat and meat alternatives in place of the grain component at breakfast three times per week

Nutrient	Mean	SD	3-year-olds' reference*	4–5-year-olds' reference*
Energy (kJ)	2208.52	227.15	3126.83–4016.64	3355.57–4362.53
Energy (kcal)	527.85	54.29	747.33–960.00	802.00–1042.67
Protein (g)	34.43	3.10	9.87	10.81
Carbohydrate (g)	76.65	9.57	86.67	86.67
Fat (%)	17.97	5.67	30–40	25–35
Total dietary fibre (g)	7.46	1.86	10.46–13.44	11.23–14.60
Vitamin A (RAE, µg)	511.66	178.69	200	266.67
Vitamin E (mg)	1.69	0.77	4	4.67
Ca (mg)	657.83	90.76	466.67	666.67
Fe (mg)	4.25	2.13	4.67	6.67

*For energy, protein, carbohydrate, total dietary fibre, vitamin A, vitamin E, Ca and Fe, the reference value is two-thirds of the Dietary Reference Intake^(6,7) with physical activity levels ranging from sedentary to active. The Acceptable Macronutrient Distribution Range was used as the reference value for fat.

Table 2 Comparison of the Child and Adult Care Food Program (CACFP) food group requirements with the Healthy US Style Eating Pattern recommended by the Dietary Guidelines for Americans (DGA) and the National Academy of Medicine (NAM) recommended food group requirements

	Allowable CACFP meal pattern with meat/meat alternative replacing grain at breakfast*	DGA recommended pattern†	NAM recommended meal pattern‡
Vegetable, cup (237 ml) equivalents	0.25–1.5	1	0.6–1.1
Fruit, cup (237 ml) equivalents	0–1.25	1	0.7–1.2
Grain, oz (28.3 g) equivalents	0.5–1	3.33	2.4–3.4
Dairy/milk, cup (237 ml) equivalents	1.5–2	1.67	1.2
Meat or meat alternative/protein foods, oz (28.3 g) equivalents	2–2.5	2.67	1.4–2.4

*Total CACFP meal pattern component requirements for breakfast, lunch and snack for 3–5-year-old children with meat/meat alternative replacing grains at breakfast. See Fig. 1 for details.

†Two-thirds of the suggested daily food group intake in MyPlate equivalents for 5857–60 kJ (1400 kcal) Healthy US Style Eating Pattern as recommended by the DGA⁽⁴⁾.

‡NAM recommended requirements for breakfast, lunch and snack for 2–4-year-old children⁽⁵⁾.

The grain ounce-equivalents required by the CACFP meal patterns is well below the number recommended by the DGA as well as the number recommended in the NAM report (Table 2). The number of meat/meat alternative ounce-equivalents provided by the CACFP meal pattern overlaps the number recommended by the NAM report but falls slightly below the number recommended by the DGA. The number of dairy cup-equivalents provided by the CACFP meal pattern overlaps the number recommended in the NAM report. The range of vegetable cup-equivalents and the range of fruit cup-equivalents provided by the CACFP meal pattern include the number of equivalents recommended by both the DGA and the NAM report.

Discussion

The CACFP meal patterns are built on the concept of required meal components and, as such, the regulations

do not address nutrient-based standards. Although there are many benefits to this approach, component-based standards leave room for nutrient imbalances. The current analysis of a menu based on options set forth in the current CACFP meal standards found that the amount of protein provided was more than double the reference values, while energy, carbohydrate, fibre and fat were below the reference value. While the present study did not include information regarding food that was served or consumed, prior research regarding the nutrient content of foods consumed in childcare centres has revealed similar nutrient patterns in which protein intake was double the DRI⁽¹¹⁾ and energy^(11,12), carbohydrate⁽¹¹⁾, fibre⁽¹²⁾, vitamin E⁽¹¹⁾ and Fe⁽¹¹⁾ intakes were below the reference values.

Although the meat/meat alternative ounce-equivalents required by the CACFP meal pattern are slightly below the number recommended by the DGA, the meal pattern provides protein well beyond the DRI. The protein content



is worrisome in that protein intake during childhood has been shown to be positively associated with BMI^(13–15) as well as other important health-related variables such as the timing of puberty⁽¹⁶⁾. The low carbohydrate values are a concern given the inverse relationship between carbohydrate intake and BMI during childhood^(13,14). The low fibre content of the menu is potentially concerning as well since dietary fibre consumption has been found to be inversely associated with the risk of CVD, type 2 diabetes and some forms of cancer⁽¹⁷⁾.

The origin of the macronutrient imbalances revealed in our menu analysis can be elucidated by comparing the CACFP meal pattern with the DGA⁽⁴⁾ and the NAM report recommendations⁽⁵⁾. The required number of grain component servings is notably fewer in the CACFP meal pattern. Only 0.5–1 grain ounce-equivalent is required by the CACFP meal patterns for 3–5-year-olds whereas the DGA recommends 3.33 grain ounce-equivalents (Table 2).

Admittedly, our selection of two-thirds of the DRI as the benchmark is somewhat arbitrary. While it has been suggested that children receiving full-time care may require one-half to two-thirds of their nutrient requirements while in childcare⁽¹⁰⁾, research is needed to better inform policy makers regarding the optimal proportion of nutrients to be provided children while in childcare settings.

Public health implications

An estimated 73 % of children aged 3–5 years and not yet in kindergarten participate in some form of weekly childcare, with the majority of these children receiving centre-based care on a weekly basis⁽¹⁸⁾. Optimal growth and development are highly dependent on the provision of adequate nutrients during childhood. Because lifelong eating habits are established during the early formative years, the foods served to pre-school children are considered an important public health matter⁽¹⁹⁾. Yet there is a paucity of research supporting the CACFP meal pattern in general and the rule that allows meat/meat alternatives to be served in place of grains in particular.

When examining the issue of menu oversight, a review of state regulations regarding childcare menus found that few states require a review by a nutrition professional for menus in childcare centres (16 %) or family childcare homes (6 %)⁽²⁰⁾. The current meal pattern combined with the latitude afforded some providers has the potential to result in nutritional imbalances. The CACFP meal pattern for 3–5-year-old children appears to be in need of revision if it is to align with the DRI^(6,7), the DGA⁽⁴⁾ and the NAM report⁽⁵⁾.

In the interim, the findings presented here should be taken into consideration when planning childcare meals. In addition, parents need to understand what is consumed at childcare in order to better plan meals at home. Lastly, it is important to recognize the risk that children may

experience a nutrient shortfall if they are provided only the required amount of each meal component.

Acknowledgements

Financial support: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors. *Conflict of interest:* None. *Authorship:* J.A.H. conducted all statistical analyses, developed the menu, wrote the main sections of the manuscript, verified nutrient data entry and co-originated the study idea. O.C. performed the nutrient analysis, assisted with data management, calculated reference values, created drafts of the tables and provided input on drafts of the article. P.P. provided guidance in the early stages of the menu development, assisted with the development of the recipes used in the nutrient analysis, co-originated the study idea and provided input and critical feedback on drafts of the menu. P.B. assisted with the development of the menu and the recipes used in the nutrient analysis, contributed to sections of the manuscript and provided critical feedback on drafts of the manuscript. D.L. reviewed the menus with particular regard to feasibility and compliance with the Child and Adult Care Food Program standards; she also provided input and critical review of the manuscript. *Ethics of human subject participation:* This study did not utilize human subjects.

Supplementary material

To view supplementary material for this article, please visit <https://doi.org/10.1017/S136898001900377X>

References

1. US Department of Agriculture, Food and Nutrition Service (2016) USDA announces effort to strengthen nutrition among young children, create healthy habits early. <https://www.fns.usda.gov/pressrelease/2016/fns-000616> (accessed January 2018).
2. Crepinsek MK, Burstein NR, Lee EB *et al.* (2002) Meals offered by Tier 2 CACFP family child care providers – effects of lower meal reimbursements. <https://www.researchconnections.org/childcare/resources/7503> (accessed January 2018).
3. US Department of Agriculture, Food and Nutrition Service (2016) Child and Adult Care Food Program: Meal Pattern Revisions Related to the Healthy, Hunger-Free Kids Act of 2010; Final Rule. *Fed Regist* **81**, 24348–24383; available at <https://www.govinfo.gov/content/pkg/FR-2016-04-25/pdf/2016-09412.pdf> (accessed January 2019).
4. US Department of Health and Human Services & US Department of Agriculture (2015) Dietary Guidelines for Americans, 2015–2020. <https://health.gov/dietaryguidelines/2015/> (accessed January 2019).
5. Institute of Medicine (2011) *Child and Adult Care Food Program: Aligning Dietary Guidance for All*. Washington, DC: The National Academies Press.



6. Panel on Macronutrients, Subcommittee on Upper Reference Levels of Nutrients, Subcommittee on Interpretation and Uses of Dietary Reference Intakes & Standing Committee on the Scientific Evaluation of Dietary Reference Intakes, Food and Nutrition Board, Institute of Medicine (2005) *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: The National Academies Press.
7. Institute of Medicine (2011) *Dietary Reference Intakes for Calcium and Vitamin D*. Washington, DC: The National Academies Press.
8. Frampton AM, Sisson SB, Horm D *et al.* (2014) What's for lunch? An analysis of lunch menus in 83 urban and rural Oklahoma child-care centers providing all-day care to pre-school children. *J Acad Nutr Diet* **114**, 1367–1374.
9. Tovar A, Benjamin-Neelon S, Vaughn AE *et al.* (2018) Nutritional quality of meals and snacks served and consumed in family child care. *J Acad Nutr Diet* **118**, 2280–2286.
10. Benjamin Neelon SE & Briley ME (2011) Position of the American Dietetic Association: benchmarks for nutrition in child care. *J Am Diet Assoc* **111**, 607–615.
11. Rasbold AH, Adamiec R, Anderson MP *et al.* (2016) Macronutrient and micronutrient intakes of children in Oklahoma child-care centres, USA. *Public Health Nutr* **19**, 1498–1505.
12. Andreyeva T, Kenney EL, O'Connell M *et al.* (2018) Predictors of nutrition quality in early child education settings in Connecticut. *J Nutr Educ Behav* **50**, 458–467.
13. Pimpin L, Jebb S, Johnson L *et al.* (2016) Dietary protein intake is associated with body mass index and weight up to 5 y of age in a prospective cohort of twins. *Am J Clin Nutr* **103**, 389–397.
14. Skinner JD, Bounds W, Carruth BR *et al.* (2004) Predictors of children's body mass index: a longitudinal study of diet and growth in children aged 2–8 y. *Int J Obes Relat Metab Disord* **28**, 476–482.
15. Öhlund I, Hernell O, Hörnell A *et al.* (2010) BMI at 4 years of age is associated with previous and current protein intake and with paternal BMI. *Eur J Clin Nutr* **64**, 138–145.
16. Gunther A, Karaolis-Danckert N, Kroke A *et al.* (2010) Dietary protein intake throughout childhood is associated with the timing of puberty. *J Nutr* **140**, 565–571.
17. Dahl WJ & Stewart ML (2015) Position of the Academy of Nutrition and Dietetics: health implications of dietary fiber. *J Acad Nutr Diet* **115**, 1861–1870.
18. Corcoran L & Steinley K (2019) *Early Childhood Program Participation, From the National Household Education Surveys Program of 2016. (NCES 2017-101.REV)*. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, US Department of Education; available at <https://nces.ed.gov/pubs2017/2017101REV.pdf> (accessed January 2020).
19. Briley M & McAllaster M (2011) Nutrition and the child-care setting. *J Am Diet Assoc* **111**, 1298–1300.
20. Benjamin SE, Copeland KA, Craddock A *et al.* (2009) Menus in child care: a comparison of state regulations with national standards. *J Am Diet Assoc* **109**, 109–115.