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Nutritional Quality of Meals and Snacks Served and Consumed in Family Child Care

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1 *Research Snapshot*

2 *Research Questions:* What food is being served to children attending family child care homes, and to
3 what extent do children consume this food? What is the nutritional quality of the food served and
4 consumed?

5 *Key Findings:* Children consumed 60-80% of the food served; for vegetables, dairy, and whole grains,
6 children ate 60-71% of what was served. The Healthy Eating Index-2010 total score for food served was
7 63.6 and for food consumed was 61.7. The nutritional quality of the food served could be improved by
8 offering more vegetables and lean protein foods and replacing refined grains with whole grains.

9

10 **Abstract**

11 **Background.** Improving the nutritional quality of food, including beverages, served in early care
12 and education settings should enhance children’s diet quality. However, few studies have
13 explored the relationship between what is served and consumed in family child care homes
14 (FCCH).

15 **Objective.** To describe the nutritional quality of food served to children in FCCH and to assess
16 the extent to which children eat what is served.

17 **Design.** This study was a cross-sectional analysis using baseline data (n=166) from a cluster-
18 randomized-controlled trial (2013 to 2016).

19 **Participants/setting.** Eligible FCCH’s in central North Carolina had to have at least two
20 children between 18-months-four years, have been in business for at least two years, and serve at
21 least one meal and one snack.

22 **Main outcome measures.** Food was captured using the Diet Observation at Child Care protocol.

23

24 **Statistical analyses.** Frequencies, means, and multivariate analysis were used to examine the
25 relationship between food served and consumed by food groups, and by Healthy Eating Index
26 (HEI-2010).

27 **Results.** Children consumed between 61-80% of what was served, with vegetables, having the
28 lowest percent consumed (61.0%). Total HEI-2010 score for food served was 63.6 (10.4) and for
29 food consumed was 61.7 (11.5), out of a 100-point maximum. With regards to food served,
30 FCCH providers came close to meeting HEI-2010 standards for dairy, whole fruit, total fruit and
31 empty calories. However, providers appeared to fall short when it came to green and beans,
32 seafood/plant proteins, total vegetables, whole grains, and fatty acids. They also exceeded
33 recommended limits for sodium, and refined grains.

34 **Conclusions.** While FCCH's are serving some healthy food, mainly fruit, dairy and few empty
35 calories, there is room for improvement with regards to vegetables, grains, seafood and plant
36 protein, fatty acids, and sodium. Future trainings should help providers find ways to increase the
37 serving and consumption of these foods.

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49 **Background**

50 Early care and education (ECE) programs are ideal settings to support the development of
51 healthy habits in young children. In the United States, 60% of children under five years of age
52 receive non-parental care,¹ spending, on average, over 26 hours a week in this setting.²
53 Recommendations suggest that children enrolled in full-time child care obtain two-thirds of their
54 daily nutrients while in care from meals and snacks consistent with the Dietary Guidelines for
55 Americans (DGA).³⁻⁵ Inclusion of these recommendations in state ECE program licensing vary⁴;
56 however, ECE programs that participate in federally-funded programs, such as the Child and
57 Adult Care Food Program (CACFP),⁶ are subject to nutrition regulations and policies.
58 Despite these recommendations and federal programs encouraging ECE programs to provide
59 nutritious food and beverages, studies suggest that there are several opportunities for
60 improvement.⁷ Findings appear consistent whether studies have examined what is being served⁸⁻
61 ¹⁴ or what is being consumed.¹⁵⁻¹⁷ However, few studies have measured and evaluated the
62 differences between the amounts and quality of food and beverages served to and consumed by
63 children. Furthermore, most studies have focused on child care centers,¹⁸ but overlooked family
64 child care homes, a form of ECE typically operated from the provider's own home. Family child
65 care homes are much smaller programs that generally offer flexible child care hours and lower
66 enrollment fees compared to child care centers^{19,20} – characteristics that are particularly
67 appealing to parents employed in shift work or low-income families. Regulations for family child
68 care homes are often less stringent, including those around the promotion of healthy foods.²¹ In
69 this type of setting, understanding children's compliance with nutritional guidelines, and the
70 extent to which children are consuming what is being offered can help inform future
71 interventions. This study describes the nutritional quality of food served and consumed by

72 children in family child care homes, assessing the extent to which the children consume what
73 they are served, and assessing the association between the nutritional value of food served and
74 consumed.

75 **Methods**

76 This cross-sectional analysis used baseline data from the Keys to Healthy Family Child Care
77 Homes (Keys) study, which was conducted from 2013 to 2016 with family child care homes
78 across central North Carolina (NC).²² Keys was a cluster-randomized controlled trial that
79 evaluated the efficacy of a childhood obesity prevention intervention designed to help providers
80 become healthy role models, improve nutrition and physical activity environments, and
81 implement effective business practices in their family child care homes. The study enrolled and
82 measured 166 family child care homes and providers and 496 children ages 18 months to 4 years
83 (approximately 3 children per home). Family child care homes were recruited in multiple waves
84 from counties across central NC.²² To target areas with the greatest need, recruitment efforts
85 prioritized counties where childhood overweight and obesity prevalence was above the state
86 average and median household income was below the state median (using US Census data).²³
87 When recruitment extended into higher income counties (i.e., above the state median), efforts
88 were directed at low-income census tracts and family child care homes accepting child care
89 subsidies. Within each county, community partners helped distribute study information via their
90 existing communication channels with family child care homes (newsletters, emails, partner
91 website, trainings, group meetings). In addition, an invitation to participate in the study and a
92 study flyer were emailed and/or mailed directly to licensed family child care homes in each
93 county. Interest and eligibility were assessed during follow-up telephone calls. To be eligible for
94 the study, family child care homes had to have at least two children between the ages of 18

95 months and four years in their care, have been in business for at least two years with no plans of
96 closing in the coming year, and serve at least one meal (breakfast, lunch, or dinner) and one
97 snack (morning or afternoon snack) to children in their care. Child care providers and parents of
98 children in care provided written informed consent to participate in the Keys study. Measures
99 were collected by trained and blinded data collectors during two-day onsite observations,
100 including observation of children's dietary intake. For diet observations to be considered valid
101 and to be included in the data analysis for this study, observations for each child had to capture
102 lunch and at least one additional meal or snack (i.e., breakfast, morning or afternoon snack,
103 dinner). Detailed information about the Keys study design and protocols have been reported in
104 full elsewhere,^{22,24} but aspects relevant to this analysis are described briefly below. All study
105 protocols were approved by the Institutional Review Boards of the University of North Carolina
106 at Chapel Hill and Duke University Medical Center.

107 **Data Collection and Measures**

108 **Child dietary intake in the family child care home**

109 Children's dietary intake while in child care was assessed with the Diet Observation at Child
110 Care (DOCC) protocol.^{24, 25} The DOCC protocol has demonstrated good validity and reliability
111 for capturing dietary intake of children in child care.²⁴ For this project, trained data collectors
112 observed and recorded all meals and snacks served to participating children across two full days
113 of child care. According to DOCC protocol, one observer can accurately observe and record a
114 maximum of three children. Typically, this included breakfast/morning snack, lunch, and an
115 afternoon snack.

116 Data collectors estimated the quantity of food and beverages served, added (i.e., second
117 helpings), exchanged, wasted, and remaining following the end of each meal and snack to
118 calculate the total quantity served to and consumed by children. If additional detail was needed
119 about food or beverages served (e.g., preparation of mixed dishes), the data collector would
120 request this information from the family child care home provider. As noted above, valid diet
121 observation days had to capture lunch and at least one additional meal or snack, thus setting a
122 minimum level of data required for each day given that number of meals and snacks served can
123 vary by family child care home and child (depending on the hours they are enrolled in care). If a
124 child was absent or left early (before sufficient diet data could be collected), an additional visit
125 was conducted to repeat the diet observation for that child. DOCC protocol allows observation of
126 up to three children at a time. Typically, the family child care homes required only one observer,
127 but a second was present whenever a home had four or more children participating.

128 DOCC data were analyzed using the Nutrition Data System for Research (NDSR) software
129 (Nutrition Coordinating Center, University of Minnesota, Minnesota).²⁶ Data were entered
130 separately for food served and food consumed. Specific variables from the NDSR output that
131 were examined for food served and consumed included energy (kcal/day), total vegetables
132 (cups/day), total vegetables w/out potatoes (cups/day), whole fruit (cups/day), 100% fruit juice
133 (ounces/day), whole grains (ounces/day), refined grains (ounces/day), dairy (cups/day), and total
134 protein (grams/day). These specific variables were selected because they allow comparison with
135 nutrition recommendations in the DGA's as well as the nutrition standards of the CACFP. In
136 addition, the NDSR output was used to calculate Healthy Eating Index (HEI-2010) scores for
137 both food served and consumed (based on all meals and snacks observed) using the HEI-2010
138 scoring rubric²⁷ and the SAS macro provided by NDSR.²⁸ As per protocol, diet data for each

139 child were first summed across the two observation days and then HEI-2010 scores were
140 calculated from these sums. HEI-2010 was designed to measure diet quality in terms of how well
141 diets conform to the 2010 Dietary Guidelines for Americans.²⁹ The total HEI-2010 score
142 represents the sum of 12 components scores (maximum component score shown in parentheses),
143 including total fruit (5), whole fruit (5), total vegetables (5), green and beans (includes dark
144 green vegetables and cooked, dried beans and peas because intakes of these types of vegetables
145 are furthest from the amounts recommended in the USDA Food Patterns) (5), whole grain (10),
146 dairy (10), total protein food (5), seafood and plant proteins (5), fatty acids (10), refined grains
147 (10), sodium (10) and empty calories (20). Total HEI-2010 scores can have a maximum value of
148 100 which indicates high diet quality.²⁷

149 **Other variables**

150 Demographic information from family child care home providers and parents of participating
151 children were collected via self-administered questionnaires. Provider surveys captured
152 characteristics of the family child care home, including years of operation, number of children
153 enrolled, participation in subsidy programs such as CACFP and North Carolina's quality
154 improvement rating system (where ECE programs are rated on a scale of one to five stars based
155 on staff education, program standards, and compliance history; a rating of one star means that an
156 ECE program meets North Carolina's minimum licensing standards) and personal demographics,
157 including sex, age, race (Black/African American, White, Asian/Asian American, multiple race
158 or other), and education (high school degree, associate degree, college degree, or graduate
159 degree). Parent surveys captured the child's sex, age, and race. During site visits, data collectors
160 also measured child and provider height and weight using standardized protocols described
161 elsewhere.²²

162 **Statistical Analysis**

163 Frequencies, percentages, means, and standard deviations were calculated from the demographic data to
164 describe characteristics of children and providers. Means and standard deviations were calculated for the
165 food served and consumed, specifically, energy (kcal/day), total vegetables (cups/day), total
166 vegetables w/out potatoes (cups/day), whole fruit (cups/day), 100% fruit juice (cups/day), grains
167 (ounces/day), whole grains (ounces/day), refined grains (ounces/day), dairy (cups/day), protein
168 (grams/day), as well as HEI-2010 total and component scores. To assess children's consumption
169 of food served, the percent of served that was consumed was calculated (i.e., consumed/served x
170 100) for all energy and food group variables. Multi-level mixed effects models were used to
171 examine the association between HEI-2010 of food served (independent variable) and HEI-2010
172 score of food consumed (dependent variable). Models included a random intercept to account for
173 nesting of children within family child care homes. Child level (child sex, age and BMI) and
174 home level covariates (provider race, education, BMI, child care quality star rating and CACFP
175 participation) were included. Covariates that did not contribute significantly to the model (p-
176 value <0.10) were removed in a final reduced model. All analyses were conducted in SAS 9.3,
177 2013 (SAS Institute, Inc).³⁰

178 **Results**

179 Data were available on 166 family child care homes and 495 children (diet data was missing for
180 1 child). Family child care homes had a mean (standard deviation, SD) of 7.2 (3.6) children
181 enrolled and 91.0% of homes participated in CACFP (Table 1). All providers were women with
182 a mean (SD) age of 49.4 (9.1) years. Providers were predominately Black/African American
183 (74.1%) and either overweight (24.1%) or obese (65.7%). Among the children, there were
184 similar numbers of boys and girls, with a mean (SD) age of 35.7 (11.4) months old. Children

185 were predominantly Black/African American (63.3%). Their mean (SD) body mass index (BMI)
186 z-score was 0.8 (1.2), and 17.4% were overweight and 16.0% were obese.

187 Child diet data was available for all 495 children, capturing 990 separate observation days. All
188 495 children had at least one valid day (lunch plus at least one additional meal or snack). There
189 were 19 cases of non-valid observation days (3 completely missing, 5 missing lunch, and 11
190 lunch only), so a total of 971 valid observation days were utilized. In other words, there were 19
191 children with only one day of observation and the remaining 476 had two days.

192 None of the family child care home providers served meals and snacks “family style, meaning
193 that children could serve themselves and decide what portion of food to take. Instead, 97% of
194 providers served the food to children and decided children’s portions. Only 1.2% served food but
195 allowed children to decide portions, and 1.8% allowed children to serve themselves but provider
196 decided the portions.

197 A comparison of different food groups served versus consumed is presented in Table 2. Children
198 were served on average 738 (212) kcals per day and consumed 545 (191) kcals, or 74% of what
199 was served. Across the different food groups, children consumed between 61-80% of the amount
200 served. Percent of food served that was consumed varied slightly between food groups, with
201 children consuming a slightly lower percentage of vegetables compared to other food groups.

202 A comparison of the HEI-2010 total and component scores for food served and consumed is
203 presented in Table 3. The food served and consumed in child care was not meeting dietary
204 guidelines.²⁸ The average total HEI-2010 score of food served was 63.6 (10.4) and for food
205 consumed was 61.7 (11.5). With regards to food served, family child care home providers came
206 close to meeting HEI-2010 standards for dairy (9.6 (1.3) out of 10), whole fruit (4.8 (0.9) out of

207 5), total fruit (4.5 (1.0) out of 5) and empty calories (16.9 (3.7) out of 20). However, providers
208 appeared to fall short when it came to green and beans (1.4 (2.0) out of 5), seafood/plant proteins
209 (1.8 (2.3) out of 5), whole grains (3.9 (3.3) out of 10), total vegetables (2.3 (1.1) out of 5), and
210 fatty acids (4.3 (3.2) out of 10). They also appeared to exceed recommended limits for sodium
211 (4.9 (2.9) out of 10), and refined grains (5.4 (3.3) out of 10).

212 Multi-level mixed effects models found that the HEI-2010 score of what children were served
213 was significantly associated with the HEI-2010 score of what they consumed, even after
214 adjusting for child and home level covariates. A 1-unit increase in HEI-2010 served was
215 associated with a 0.97-unit increase in HEI-2010 consumed (Table 4).

216 **Discussion**

217 The goal of this study was to describe what children are being served and what they are
218 consuming in family child care homes, a unique type of ECE setting. Findings from this study
219 indicate that there is great room for improvement in the quality of food and beverages served to
220 and consumed by children while in family child care homes, particularly with regards to greens
221 and beans and total vegetables, seafood/plant proteins, whole and refined grains, fatty acids, and
222 sodium. Also, children may selectively eat more of some food and less of others (e.g.,
223 vegetables). While children do not eat everything served to them, the overall quality of food
224 served appears to predict the quality of food consumed. These findings, therefore, reiterate the
225 importance of programmatic and policy efforts to improve the quality of food served to children.
226 In addition, efforts to help providers introduce and encourage the consumption of healthy foods
227 is clearly warranted.

228 This study found that overall quality of food served and consumed in this setting did not meet
229 dietary guidelines assessed by the HEI-2010, which is consistent with the literature. In the Keys
230 sample, the total HEI-2010 score for food served was only 63.6 and for foods consumed was
231 only 61.7.²⁹ These findings are similar to what others have found about the quality of food
232 served in child care settings whereby vegetables and whole grains are limited.^{10,30-32,14} These
233 results are also comparable to HEI-2010 scores for young children’s total daily intakes estimated
234 from in the National Health and Nutrition Examination Survey (NHANES). Meals and snacks
235 consumed in child care homes by children in the Keys study sample had a slightly higher score
236 for empty calorie (better diet quality) and a slightly lower score for total protein food and for
237 seafood/plant proteins compared to children in the NHANES sample.³⁷ Together these studies
238 reinforce the need to improve the quality of food served in child care as a means to support
239 healthier dietary intakes in children. Furthermore, ECE providers would also likely benefit from
240 strategies and resources on ways to serve more vegetables as well as practices they can use to
241 encourage children to consume them. For example, repeated exposure of vegetables,³⁶
242 incorporating sensory learning activities,³⁶ sitting with children during meals,³⁷ being
243 enthusiastic role models,³⁸⁻⁴⁰ involving children in meal preparation,⁴¹ serving meals and snacks
244 “family style”,⁴ and talking with children about healthy foods^{42,43} has been associated with
245 healthier eating habits.

246 These findings highlight the importance of having strong nutrition guidelines, such as CACFP,
247 for food and beverages served at child care. While results for this study were collected prior to
248 the 2017 CACFP revisions, recent updates to these program guidelines should help address
249 several of these inadequacies as they have a greater emphasis on providing healthy meat options
250 (including seafood and plant proteins), vegetables, and whole grains, while avoiding added

251 sugars (e.g., flavored milk, grain-based desserts).⁴⁴ Future studies should assess the impact of
252 these rule changes.

253 This study also found that the diet quality of food served and consumed in this setting were
254 highly associated, even after adjusting for child and home level factors. While serving nutritious
255 food is clearly important, ECE providers view child preference as a barrier.⁴⁵ Their concerns
256 appear at least in part to be substantiated by these results. Percent of food served that was
257 consumed was similar across food groups; however, children appeared to consume slightly less
258 of the vegetables than they were served. Similar findings were reported in a plate waste study
259 conducted with preschool-aged children in Head Start showing that vegetables contributed to
260 61% of plate waste, indicating that children were consuming less of the vegetables being
261 served.⁴⁶ Food waste is a real concern for ECE providers, especially family child care home
262 providers, as resources are very limited.⁴⁷ Together, these findings speak to the importance of
263 providing high quality food in ECE settings and helping providers encourage and support healthy
264 eating habits in children, so that when healthy food is served, children are willing and excited to
265 eat it. Future studies should continue to explore ways to increase child acceptance of certain food
266 especially vegetables.

267 There were several strengths to this study including detailed observation of both food being
268 served and consumed by trained observers, examination of the understudied setting of family
269 child care homes, and a large sample size. This study however was limited in that observed food
270 and beverages served to and consumed by children were captured over two days of care only.
271 Data on feeding practices of the childcare providers was not included in this analysis and may be
272 an important factor to consider for future studies. Finally, the results of this may not be
273 generalizable to other family child care homes, to other ECE settings such as child care centers,

274 or to other regions of the country beyond North Carolina. It is important to note that recruitment
275 targeted low-income areas, and as a result, the majority of the homes in this study received
276 CACFP reimbursements. Hence, results may not be generalizable to family child care homes that
277 do not participate in CACFP. In addition, this study cannot predict how the relationship between
278 food served and consumed might change if the quality of the food served improves. Caution
279 must also be taken to avoid possible unintended consequences, such as creating a larger disparity
280 between food served and consumed when healthier foods are introduced, emphasizing the need
281 for ECE provider training and education on effective feeding strategies.

282 **Conclusions**

283 The findings from this study suggest that while family child care homes are serving some healthy
284 food, mainly fruit, dairy and few empty calories, there is much room for improvement with
285 regards to vegetables, whole and refined grains, seafood and plant protein, fatty acids, and
286 sodium. The new CACFP rules are a step in the right direction to improve what is provided.
287 Continued efforts are needed in less studied environments, such as family child care homes.
288 Future trainings and support should offer child care providers strategies to help increase the
289 amount of vegetables that are served and those that are consumed by children.

290

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