

4-2018

Nutrition Knowledge, Attitudes, and Fruit and Vegetable Intake as Predictors of Head Start Teachers' Classroom Mealtime Behaviors

Katherine Halloran
University of Rhode Island

Kathleen S. Gorman
University of Rhode Island, kgorman@uri.edu

Megan Fallon
University of Rhode Island

Alison Tovar
Follow this and additional works at: https://digitalcommons.uri.edu/nfs_facpubs
University of Rhode Island, alison_tovar@uri.edu

The University of Rhode Island Faculty have made this article openly available.
Please let us know how Open Access to this research benefits you.

Terms of Use

This article is made available under the terms and conditions applicable towards Open Access Policy Articles, as set forth in our [Terms of Use](#).

Citation/Publisher Attribution

Halloran, K., M., Gorman, K., Fallon, M., & Tovar, A. (2018). Nutrition Knowledge, Attitudes, and Fruit and Vegetable Intake as Predictors of Head Start Teachers' Classroom Mealtime Behaviors. *Journal of Nutrition Education and Behavior*, 50(4), 340-348. doi: 10.1016/j.jneb.2017.10.015
Available at: <http://dx.doi.org/10.1016/j.jneb.2017.10.015>

This Article is brought to you for free and open access by the Nutrition and Food Sciences at DigitalCommons@URI. It has been accepted for inclusion in Nutrition and Food Sciences Faculty Publications by an authorized administrator of DigitalCommons@URI. For more information, please contact digitalcommons-group@uri.edu.

Nutrition Knowledge, Attitudes, and Fruit and Vegetable Intake as Predictors of Head Start Teachers' Classroom Mealtime Behaviors

The University of Rhode Island Faculty have made this article openly available.
Please let us know how Open Access to this research benefits you.

This is a pre-publication author manuscript of the final, published article.

Terms of Use

This article is made available under the terms and conditions applicable towards Open Access Policy Articles, as set forth in our [Terms of Use](#).

INTRODUCTION

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

Childhood obesity is a serious public health problem with approximately 14% of preschool aged children in the U.S. considered to be obese.¹ Given that children are spending an increasing amount of time in child care, with 61% of preschoolers in center-based care, child care teachers play an important role in influencing the diets of children, primarily through their mealtime interactions.²⁻⁶ Although teacher nutrition knowledge and attitudes are thought to influence their mealtime behaviors with children,^{7,8} evidence is still lacking. Similarly, it is unclear if child care teachers' own dietary behaviors influence their mealtime behaviors with children.^{9,10} Given that children who are in center-based care consume up to 75% of their daily meals in the child care setting, there is a need to further understand teacher nutrition knowledge, attitudes, dietary behaviors and their classroom mealtime behaviors in order to inform future interventions.

A number of mealtime behaviors, including feeding practices, have been associated with better health outcomes in children.¹¹⁻¹⁵ Controlling feeding practices, for example, exerting pressure to eat, restricting foods and using food as a reward have been associated with less optimal outcomes, such as lower intake of vegetables and increased intake of unhealthy “off-limits” foods, even when not hungry.¹⁶⁻²² In contrast, optimal behaviors are those considered more responsive and positive²³ (e.g., responding to children’s signals of hunger and satiety, responding positively to children’s attempts to self-feed), where caregivers allow children to control the amount of food they eat. These aforementioned practices have been associated with improved ability to self-regulate energy intake.²⁴ Although there are a growing number of studies exploring the mealtime behaviors and feeding practices of child care teachers,^{10,25} most of the

24 literature has focused primarily on parents. While parents and teachers vary when it comes to the
25 role they play in influencing children's eating,^{26,27} the parent feeding literature provides an
26 important foundation for examining the feeding practices of child care teachers.

27 Some studies that have included child care teacher feeding practices have explored how
28 practices vary among teachers. For example, teachers with more education and experience
29 engaged in more optimal mealtime behaviors⁷ (e.g., sitting with children during the meal,
30 consuming the same foods as children). The association between teachers' own nutritional
31 knowledge and attitudes in relation to their mealtime behavior with children, above and beyond
32 teachers' general education and experience, is less well understood, and findings are mixed. One
33 study reported a positive association between mealtime behavior of teachers and nutrition
34 knowledge and attitudes,⁷ while others reported no demonstrable effect of improved nutrition
35 knowledge on teacher behavior.²⁸ A better understanding of how nutrition knowledge and
36 attitudes influence teacher behavior, however, has important implications for teaching education.
37 Research examining nutrition attitudes and perceptions among Head Start teachers revealed
38 common beliefs that children's eating behaviors and weight status were not connected and
39 skepticism regarding the definition of overweight.²⁹ Additional research has also revealed
40 nutrition knowledge to be low among child care providers.⁹ A recent study examining Head Start
41 teachers found that 97% of teachers could only answer 3 or fewer of 5 nutrition questions
42 correctly. Furthermore, 24% of Head Start directors felt that lack of knowledge among teachers
43 about how to encourage healthy eating was an important impediment to obesity prevention.³⁰
44 Learning more about teacher nutrition knowledge and attitudes may help improve teacher
45 classroom mealtime interactions with children.

46 The study of teacher knowledge and attitudes as an influence on their own health
47 promoting behaviors, and ultimately on children's behaviors, is supported by a number of
48 theories including Bronfenbrenner's ecological model,³¹ Bandura's Social Cognitive Theory,³²
49 and the Health Belief Model.³³ Both Bronfenbrenners' and Banduras' theories emphasize that
50 important adults in a child's life, including teachers, influence behavior through several
51 mechanisms including education, normative practices, and social support. Role-modeling may
52 also be a factor in health promoting behavior. There is some limited research to show that more
53 positive health characteristics and behaviors in one's own life may translate to efforts to improve
54 other's health habits. For example, lower body mass index (BMI) among doctors is associated
55 with more frequent discussions about weight loss with patients, compared to those with higher
56 BMI's.³⁴ The behaviors of Women, Infants and Children (WIC) staff were also examined in the
57 context of obesity prevention. Compared to a control group, staff members who received an
58 intervention to make healthier food choices and be more physically active were more likely to
59 report making positive changes in counseling WIC parents about their children's weight.³⁵

60 Head Start has been a pioneer in setting policies related to food and nutrition for their
61 students. For example, Head Start programs are required by Federal Program Performance
62 Standards to provide nutrition training to staff as well as families.³⁶ Research indicates high
63 levels of adherence when it comes to centers carrying out these trainings, with 92% of programs
64 teaching staff routines pertinent to feeding children and 84% offering workshops for parents for
65 preparing and buying healthy foods.³⁷ Some research suggests, however, that Head Start teachers
66 have poor overall health and diets. For example, a study looking at 173 Head Start teachers in
67 Texas found low fruit and vegetable consumption, high consumption of fast foods and sugar
68 sweetened beverages, and self-reported poor nutritional health for teachers as a whole.⁹

69 Additionally, high rates of overweight and obesity have been reported among Head Start teachers
70 across studies.^{9,10} As compared to women with similar socio-demographic backgrounds, Head
71 Start teachers were found to have poorer physical and mental health and higher rates of obesity,
72 diabetes, and high blood pressure.³⁸ Examining teacher's diets in relation to their behaviors with
73 children is an important avenue of study. Children of low socio-economic status are particularly
74 at risk for consuming unhealthy foods and obesity,³⁹ therefore, understanding factors within their
75 environments could have important implications for obesity preventions.

76 The purpose of this study was to examine the association between nutrition knowledge,
77 attitudes, and fruit and vegetable intake among Head Start teachers and their mealtime behaviors
78 (self-report and observed) in the classroom with children. Higher nutrition knowledge, more
79 positive nutrition attitude scores, and higher fruit and vegetable consumption were expected to be
80 associated with higher mealtime behavior scores in the classroom with children. Head Start
81 centers were selected to represent a homogenous set of child care settings, in order to minimize
82 center level differences in examining associations.

83 **METHODS**

84 **Study Design, Participants and Recruitment**

85 The study was a cross-sectional design collecting both survey and observational data
86 between September 2014 and May 2015 in 16 Head Start centers across Rhode Island. The study
87 was approved by the Institutional Review Board (IRB) at the University of Rhode Island in
88 September of 2014.

89 Participants were a convenience sample of 85 Head Start teachers (i.e., head, assistant,
90 special education and teacher's aides). Teachers were recruited with the assistance of the Rhode
91

92 Island Department of Education Child and Adult Care Food Program (CACFP) director and
93 initial contact was made to the 7 Head Start Directors in the state. Six of the 7 directors
94 responsible for 22 of the 32 Head Start centers across the state agreed to participate in the study
95 and alerted teachers in their centers about the study. Teachers were instructed to contact the
96 researcher and those teachers who agreed to participate scheduled a classroom visit where
97 consent was signed prior to the meal observation. Participants were assured both anonymity and
98 confidentiality in their responses both verbally and in writing (informed consent). Researchers
99 recruited other classroom teachers during these on-site visits. A total of 86 teachers were in
100 contact with the researcher, either through phone/email (19%) or in-person (81%), and 85
101 teachers enrolled in the study. One person declined to participate.

102 **Procedures**

103 Classroom observations occurred during 66 lunchtime meals (78% of meals observed)
104 and 19 breakfasts (22% of meals observed). Consistent with Head Start meal patterns, breakfast
105 typically included 1 fruit/1 vegetable (or 2 fruit or 2 vegetable servings), 1 bread/grain and 1
106 milk serving, while lunch, included all of the above, in addition to a serving of protein.⁴⁰
107 Researchers coded teachers on 42 mealtime behaviors (e.g., whether teacher ate same foods as
108 child, whether teacher talked with the children about the foods they were eating). Researchers
109 also collected data on the administration of the meal (e.g., what time meal started/ended, how
110 foods were served). Observations were performed at a removed distance from the table and
111 researchers did not interact with the children. Following the observation, teachers completed a
112 self-administered survey at their convenience and returned it to the researcher at the next visit or
113 by mail. Upon completion of the study (classroom observations and surveys), participants were
114 given a \$35 gift card.

115 **Measures**

116 **Nutrition knowledge.** A 12-item multiple choice nutrition knowledge questionnaire was
117 developed for use in this study. Two faculty members, one each in Nutrition and Psychology,
118 evaluated the measure for content validity by examining whether items were in line with current
119 United States Department of Agriculture⁴¹ (USDA) recommendations. The measure was then
120 pre-tested with graduate students in Nutrition and Psychology, further modified based on this
121 pre-test, and subsequently piloted with 5 Head Start teachers. Participants were asked to select
122 the correct answer to questions about basic healthy eating and nutrition principles in line with
123 current dietary guidelines suggested by the USDA (e.g., How many cups of vegetables should a
124 moderately active adult eat per day? Which behavior specific message supports a healthy diet?).
125 Each correct answer received 1 point and scores were summed, yielding a total score ranging
126 from 0 – 12 (alpha=0.62). Higher scores indicated higher levels of nutrition knowledge.

127 **Nutrition attitudes.** Nutrition attitudes were assessed using the Nutrition Attitudes Inventory,⁷ a
128 27-item self-report tool addressing attitudes about fostering healthy eating habits in early
129 childhood (e.g., mealtime should be used as an opportunity to educate children, teachers should
130 not force children to eat foods). The measure was originally pre-tested with registered dietitians
131 and faculty in child development and early childhood education in a past validation study. The
132 measure was found to have an internal consistency of 0.69 (alpha) in a previous study.⁷
133 Participants were asked to respond to statements on a 3-point scale (Disagree=1; No Opinion=2;
134 Agree =3). Scores were summed (range: 27-81) with higher scores indicating high agreement
135 with attitudes that have been identified as important in supporting children's healthy eating. In
136 the current study, the internal consistency of the measure was 0.62 (alpha).

137 **Fruit and vegetable intake.** Fruit and vegetable intake was assessed using The National Cancer
138 Institute (NCI) Fruit and Vegetable Screener (FVS) (By-Meal).⁴² The FVS is a 14-item tool that
139 assesses daily consumption of fruits and vegetables in cups. The recommended minimum of cups
140 of fruits and vegetables per day for adult women is 3.5 (variation is based on age, sex and level
141 of physical activity) (USDA, 2014).⁴¹ In a past validation study, fruit and vegetable intake using
142 the FVS was found to have comparable (convergent) validity with fruit and vegetable intake on
143 both the 24-hour recall ($r=0.67$) and the Food Frequency Questionnaire (FFQ) ($r=0.68$).⁴³ The
144 measure was also found to have adequate internal consistency in the current study ($\alpha=0.74$).

145 **Mealtime behavior observation.** Mealtime behaviors were assessed using a modified version of
146 the Eating Occasions-Staff Behaviors Scale, one of 16 scales from The Environment and Policy
147 Assessment and Observation (EPAO).⁴⁴ The EPAO is a 75-item scale designed to assess the
148 nutrition and physical activity environment in child care settings. The instrument was originally
149 validated in a child care environment where items were evaluated for both content and clarity,
150 then subsequently revised. Inter-observer agreement of the Eating Occasions-Staff Behaviors
151 Scale was estimated using intra-class correlation coefficient ($ICC=0.78$) in a previous study.⁴⁴
152 For the purposes of the current study, 9 original items from the Eating Occasions-Staff Behaviors
153 Scale, plus an additional 38 items designed by the authors, comprised the 47-item EPAO-
154 Expanded Feeding Practices (EPAO-EFP). The EPAO-EFP assessed the occurrence of 42
155 mealtime behaviors and included 5 additional questions about the administration of the meal
156 (i.e., breakfast vs. lunch, what time meal started/ended, how long the meal lasted, what foods of
157 a behavior (e.g., whether teacher ate same foods as child, whether teacher consumed sweet or
158 salty snacks) and 27 items captured the frequency (Never=1; 1-2 times=2; 3 or more times=3) of
159 behaviors (e.g., whether teacher talked with the children about the foods they were eating,

160 whether teachers rushed children to eat). Total scores were summed with higher scores indicating
161 more optimal mealtime behaviors (e.g., enthusiastically role modeling healthy eating, responding
162 to children's signals of hunger) (range: 42-111) ($\alpha=.70$). Interrater reliability ($Kappa=.83$)
163 was established between 2 observers (KH and MF) at the beginning of the study and confirmed
164 ($Kappa=.84$) at a later point in the study. A Kappa value between 80-100% indicates an 'almost
165 perfect' level of interrater reliability.⁴⁵

166 **Mealtime behavior self-report.** The Teacher Reported-Feeding Practices (TR-Feeding
167 Practices), is part of 1 of 3 surveys from the Environment and Policy Assessment and
168 Observation Self-Report (EPAO-SR), an 800-item self-administered version of the EPAO (for
169 both teachers and directors) assessing classroom behaviors.⁴⁶ The measure was originally
170 validated by both child care experts and parents for content validity by examining relevance,
171 format and clarity of items.⁴⁶ Reliability evidence was collected on individual staff feeding
172 behavior items in a previous study. One and 4-day estimates ranged from 0.06 to 0.92, with most
173 scores above 0.30. The TR-Feeding Practices contains 24 items that ask teachers to rate
174 statements on a scale from 1 to 6 to the degree to which they engaged in certain behaviors (e.g.,
175 praise children when they try a new food, encourage children to eat a wide variety of foods)
176 (Never=1 to Always=6) or agreed with certain behaviors (e.g., communicate the importance of
177 healthy eating to parents, role model healthy behaviors) (Strongly disagree=1 to Strongly
178 agree=6). Scores are summed to produce a total score with higher scores indicating more optimal
179 mealtime behavior (range: 24-144). In the current study, the internal consistency was 0.65
180 (α).

181 **Demographics.** Teachers completed a 24-item Demographics, Health and Center Practice survey
182 developed for this study. The survey was created using pre-existing items from 2 validated

183 measures previously used with Head Start populations, the Head Start on Healthy Living Health
184 Behavior Survey and The Head Start Teacher Survey.^{9,47} Variables used in this study include
185 teacher age, years as a child care teacher, years teaching at the current center, teacher role (i.e.,
186 head teacher, non-head teacher), education (i.e., less than college graduate, college graduate or
187 more) and nutrition training (i.e., less than 1 time a year, 1 time a year or more). These variables
188 were selected to be examined as covariates because they were found in past literature to be
189 related to mealtime behaviors with children.^{7,48} Teacher age, years as a child care teacher, and
190 years working at the current center were highly correlated and combined into a composite
191 ($\alpha=0.81$). This composite representing experience was used in all subsequent analyses.

192 **Data Analysis**

193 Descriptive measures of central tendency, variability, internal consistency (Cronbach's
194 alpha) and distributions were assessed for all variables. Analyses indicated that all items were
195 normally distributed except for nutrition attitudes. Although both square root and Log 10 were
196 initially conducted, transformations did not make the data more normally distributed. Regression
197 diagnostics were conducted to examine residuals. The P-P plot for the non-transformed attitude
198 variable was observed to follow a pattern of normal distribution. Bivariate analyses were
199 conducted for continuous variables (e.g., experience) and the independent (i.e., nutrition
200 knowledge, attitudes and fruit and vegetable intake) and dependent variables (i.e., observed and
201 self-reported mealtime behaviors) using Pearson correlations. Associations between categorical
202 covariates (education, teacher role and training variables) and the independent and dependent
203 variables were examined using ANOVA. Since the meal environments differed by time, bivariate
204 analyses were conducted between lunchtime and breakfast observations to examine significant
205 differences in observed behavior total scores. A hierarchical multivariate regression analysis

206 was conducted on observed teacher mealtime behavior. To control for significant covariates,
207 teacher experience followed by meal type was entered into the model in the first step. In the
208 second step, nutrition knowledge, attitudes and fruit and vegetable intake (independent variables)
209 were consecutively entered into the model (enter). A second hierarchical multivariate
210 regression analysis was conducted on self-reported teacher mealtime behavior. To control for
211 significant covariates, teacher experience was entered into the model in the first step. In the
212 second step, nutrition knowledge, attitudes and fruit and vegetable intake (independent variables)
213 were consecutively entered into the model (enter). Associations between the observation and
214 mealtime self-report were examined using Pearson correlations. The full reporting of these
215 findings are the focus of a separate study, however, main findings are briefly included in the
216 results.⁴⁹ All analyses were performed using SPSS software (SPSS 21.0).

217 **RESULTS**

218
219 Teachers were predominantly female (98%), and non-Hispanic white (84.6%). Half of
220 teachers (50.6%) had a college education or more, while 44.7% had some college or technical
221 school. Participants were experienced teachers with an average of 14 years of experience and
222 more than 7 years teaching at their current center. The majority (57%) identified as either head
223 teachers, or 37.6% as assistant teachers, 2.4% as special education teachers, and 2.4% as
224 teacher's aides and most teachers worked full-time (83.5%). Two-thirds (68%) of respondents
225 reported receiving nutrition training at least once a year. Mealtimes averaged 23 minutes.

226 In general, teachers' overall scores for most measures were high. Teachers demonstrated
227 high levels of nutrition knowledge ($M=9.80$, $SD=1.96$, range=3.0-12.0), nutrition attitudes
228 (Median=72.87, interquartile range (IQR)= 70-75, range=54-79), self-reported mealtime

229 behaviors ($M=121.09$, $SD=8.72$, $range=97-141$) and observed mealtime behaviors ($M=91.93$,
230 $SD=4.77$, $range=82-101$). Mean fruit and vegetable intake was found to exceed the minimum
231 recommendation of 3.5 cups per day ($M=3.88$, $SD=1.82$, $range=0.9-10.7$).

232 There was a positive association between teaching experience and both self-reported
233 ($r(83)=.27$, $p<.05$) and observed ($r(83)=.39$, $p<.01$) mealtime behavior. Mealtime behaviors
234 were not associated with teacher role, nutrition training or level of education (data not reported).
235 Comparisons (t-tests) between breakfast and lunch observations indicate that teachers' overall
236 scores were significantly higher during lunch ($M=92.76$, $SD=4.69$) than during breakfast ($M=89$,
237 $SD=3.9$), $p<.01$.

238 For self-reported and observed meal time behavior, there were no associations between
239 teacher nutrition knowledge, attitudes, and fruit and vegetable intake with one exception; there
240 was a positive association between self-reported mealtime behavior and attitudes (Table 1). More
241 positive attitudes were associated with higher self-reported mealtime behaviors.

242 Using hierarchical multivariate regression, observed teacher mealtime behavior was
243 regressed on nutrition knowledge, attitudes, and fruit and vegetable intake yielding a significant
244 model (Table 2) with meal type (lunch) and teacher experience associated with higher scores
245 during observations (Model 1). However, after controlling for meal type and teacher experience,
246 none of the independent variables were significantly associated with the overall observed
247 behavior total score (Model 2).

248 In terms of self-reported mealtime behavior (Table 3), teacher experience significantly
249 predicted teacher self-report (Model 1). After controlling for teacher experience, nutrition
250 attitudes were significantly associated with the self-reported behavior total score (Model 2).

251 Higher scores on the nutrition attitude scale were associated with higher total scores on the
252 teacher mealtime behavior self-report.

253 The analyses of the associations between the observation and mealtime self-report found
254 no overall association between the observation and mealtime self-report. An item analysis
255 yielding a more nuanced set of associations is reported elsewhere.⁴⁹

256 **DISCUSSION**

257
258 The goal of this study was to examine the association between nutrition knowledge,
259 attitudes and fruit and vegetable intake among Head Start teachers and their classroom mealtime
260 behaviors with children. The study found that teacher nutrition knowledge, attitudes and fruit and
261 vegetable intake were not related to observed behavior during mealtimes in the classroom.
262 Nutrition attitudes were positively associated with teacher self-reported classroom mealtime
263 behavior, however, only accounted for a small percentage of the variance in the model. Overall
264 study findings showed that teacher mealtime behavior was significantly associated with teacher
265 experience.

266 Direct observation has been considered the gold standard when attempting to measure
267 behavior.⁵⁰ It is somewhat surprising, therefore, that the independent variables (i.e., nutrition
268 knowledge, attitudes and fruit and vegetable intake) were not associated with observed
269 interactions within the classroom. Even more intriguing was how teachers were often engaging
270 in behaviors considered to be ‘best practices’ such as frequently engaging in talk with the
271 children about the foods they were eating and eating fruits and vegetables during mealtimes with
272 children.

273 Teachers demonstrated high levels of nutrition knowledge, positive nutrition attitudes,
274 and reported better than average fruit and vegetable intake. Based on the Health Belief Model,³³
275 we expected these factors to be associated with more optimal classroom behaviors (e.g., talking
276 with the children about the foods they were eating, enthusiastically role modeling healthy eating)
277 and were surprised that they were not. One possible explanation for this lack of association may
278 be related to how the behaviors with the observational tool are coded. For example, the coding
279 choices for most behaviors were ‘none’, ‘1-2 times’ or ‘3 or more times’. If a teacher praised a
280 behavior 3 times, they were in the same category as a teacher who praised a behavior 10 times.
281 Given that the teachers’ overall results on the observations were high, it is possible that coding
282 limitations may not have captured the degree of variability that actually exists. Also, teachers
283 under observation may in fact respond with more optimal behaviors.⁵¹

284 Head Start is known for its strong nutrition guidelines and teacher training.^{36, 52} Working
285 in Head Start programs has been associated with practicing healthier feeding practices such as
286 modeling healthy eating and teaching children about nutrition compared to other child care
287 contexts.⁴⁷ Head Start providers are also more likely to use family style feeding, another
288 recommended healthy feeding practice, at higher rates than CACFP and non-CACFP providers.⁴⁷
289 All Head Start programs are required by Federal Program Performance Standards to provide
290 nutrition training for their staff³⁶ and research has shown that Head Start teaching training
291 influences the quality of nutrition-focused instruction.⁵³ For this study, Head Start classrooms
292 were originally selected to limit variability that might occur across centers in order to be able to
293 capture individual teacher variability. Findings suggest that practices may be so uniformly
294 accepted that despite individual teacher differences, teachers behave with great consistency.
295 Head Start trainings seem to be working well and contributing to optimal mealtime behaviors.

296 Nutrition knowledge in this study refers to knowledge of basic healthy eating (e.g., How
297 many cups of vegetables should a moderately active adult eat per day? What message supports a
298 healthy diet?). Others have found that the experience, education, and positive nutrition attitudes
299 of caregivers are associated with feeding behavior⁷ and therefore it was expected that individual
300 teacher nutrition knowledge would be associated with teacher classroom behavior. The lack of
301 support for this finding suggests that although the Head Start teachers have basic healthy eating
302 knowledge, their overall experience appears to be key to engaging in optimal mealtime
303 behaviors.

304 It was hypothesized that higher fruit and vegetable intake among teachers would be
305 associated with more optimal mealtime behaviors with children, possibly through modeling of
306 healthy behaviors.³² The lack of association between their own health behavior (fruit and
307 vegetable intake) and mealtime behavior with children suggests that teacher fruit and vegetable
308 intake may be independent from how teachers behave during meals once they are in the
309 classroom. There may be several reasons for this. One explanation may be that meals are
310 generally proscribed and teachers have little input into what foods are offered. Additionally,
311 teacher's reporting of fruit and vegetable consumption was also higher than might have been
312 expected. Others have reported poorer diets among Head Start teachers,⁹ potentially suggesting a
313 response bias, with teachers wanting to report healthier habits. For example, the measure for
314 body weight (data not reported), a validated body size assessment scale, indicates that more than
315 half of participants were overweight or obese, further raising the question as to whether fruit and
316 vegetable intake was accurately reported. Some research has shown that those who are
317 overweight/obese are more likely to report that their diets are healthier than they actually are.⁵⁴

318 Teacher experience was found to be associated with both observed and self-reported
319 mealtime behavior. Previous research has also found an association between experience and
320 optimal mealtime behaviors.⁷ It is likely that older, more experienced teachers have had more
321 exposure to curriculum involving nutrition, contributing to more expertise and confidence in
322 working with children. Head Start teachers in this study, on average, had worked in Head Start
323 centers for more than a decade demonstrating low turnover, also potentially benefitting the
324 children in their care.

325 An important strength of this study is the utilization of a direct observation to gather
326 mealtime behavior data. In addition, the study enrolled approximately 1/3 of Head Start teachers
327 in the state. The study is not without limitations, however. For one, many of the constructs of
328 interest did not have well-developed measures. For example, the authors were unable to identify
329 a nutrition knowledge measure that captured basic principles of healthy eating. Some measures
330 required highly specific knowledge (e.g., role of particular nutrients),⁷ while others required
331 ratings of 'healthy' with little consensus around the correct answers.⁴⁷ Still others were
332 developed outside of the United States and deemed culturally unsuitable for U.S. populations.⁵⁵
333 As a result, the authors adapted existing measures or developed their own. This creates
334 limitations (i.e., measures not validated elsewhere), however, given the dearth of existing
335 measures, moves the study of these constructs forward, despite the limitations. In addition,
336 internal consistency scores for measures were also somewhat low. Furthermore, a fruit and
337 vegetable screener was used to represent dietary intake. Other dietary measures were considered
338 (e.g., Healthy Eating Index, Food Frequency Questionnaire) but excluded due to participant
339 burden. While others have used the FVS in the past and there is high convergent validity
340 between the FVS and dietary recall, the measure does not capture the full range of dietary intake.

341 In terms of mealtime behaviors, there were also limited tools available for observing
342 preschool classrooms. For the purposes of this study, the authors adapted an existing observation
343 measure. The original instrument included 9 items to assess staff feeding behaviors; the final
344 version included 47 items capturing a much wider range of behaviors (e.g., reasoning,
345 negotiation, support of self-regulation). The coding structure of the original measure (which was
346 adapted in this study), however, had a limited range for coding frequency of behaviors which
347 may have contributed to weaker than expected associations. Also, in general, observations
348 conducted only at one point in time may not have captured overall behavior.

349 **IMPLICATIONS FOR RESEARCH AND PRACTICE**

350
351 The results of this study have important implications for child care contexts. As has been
352 established in the literature, optimal mealtime behavior among teachers is significantly
353 associated with more teacher experience.⁷ While retaining preschool teachers is a challenge that
354 extends well beyond the focus of this study (e.g., pay, benefits), consideration of the associations
355 between teacher mealtime behavior and their experience may provide an avenue for enhancing
356 teacher retention. Additionally, the focus on Head Start specifically was intended to reduce
357 variability across types of centers to be able to focus more closely on individual level variables
358 of teachers. Given the fairly high degree of consistency and behaviors across teachers, one
359 question that emerges is whether this is unique to Head Start programs. One possibility, not
360 examined here, is that Head Start mealtime guidelines may be enforced to such a degree that
361 individual variability in teacher behavior is reduced. The existence of nutrition policies within a
362 child care context has been found to be associated with promoting healthy mealtime behaviors,

363 as compared to programs that did not have any mealtime policies.⁸ Future research would benefit
 364 from a more systematic examination of this hypothesis.

365 Based on study findings and limitations, recommendations for future studies include
 366 measuring the knowledge of procedural practices/adherence to specific Head Start mealtime
 367 guidelines in association with mealtime behaviors; replicating this study in child care teacher
 368 populations that operate under different conditions (e.g., food availability); developing more
 369 suitable measures for the field (e.g., nutrition knowledge, mealtime behavior); collecting data on
 370 all aspects of diet, not just fruit and vegetable consumption; observing breakfast only or lunch
 371 only or including designs with samples large enough to control for different mealtime settings;
 372 examining whether childcare provider variables (e.g., knowledge, attitudes) relate to child
 373 outcomes (e.g., child fruit and vegetable intake); and conducting several consecutive
 374 observations on the same teacher as multiple observations over several days would likely yield
 375 more reliable data.⁵⁶

376 REFERENCES

- 377
- 378 1. Centers for Disease Control and Prevention. Vital Signs: Progress on Childhood Obesity.
 379 2013. Available at www.cdc.gov/vitalsigns/ChildhoodObesity/index.html Last accessed
 380 December 30, 2013.
 - 381 2. Forum on Child and Family Statistics. Percentage of Children ages 3-6 in Center-Based
 382 Care. 2016. Available at www.childstats.gov/americaschildren/tables/fam3b.asp Last
 383 accessed April 1, 2016.
 - 384 3. Larson N, Ward D, Neelon S, et al. What role can child-care settings play in obesity
 385 prevention? A review of the evidence and call for research efforts. *J Am Diet Assoc*
 386 2011;111:1343-62.
 - 387 4. Hendy HM, Raudenbush B. Effectiveness of teacher modeling to encourage food
 388 acceptance in preschool children. *Appetite* 2000; 34: 61-76.
 - 389 5. Birch L, Zimmerman S, Hind H. The influence of social-affective context on the
 390 formation of children's food preferences. *Child Dev* 1980; 51: 856-861.
 - 391 6. Byrd-Bredbenner C, Marecic M, Bernstein, J. Development of a nutrition education
 392 curriculum for head start children. *Soc Nutr Educ* 1993; 25:134-139.

- 393 7. Nahikian-Nelms M. Influential factors of caregiver behavior at mealtime: a study of 24
394 child-care programs. *J Am Diet Assoc* 1997; 97: 505-509.
- 395 8. Erinoshio TO, Hales DP, McWilliams CP, et al. Nutrition policies at child-care centers
396 and impact on role modeling of healthy eating behaviors of caregivers. *J Acad Nutr Diet*
397 2012; 112: 119-124.
- 398 9. Sharma S, Dortch KS, Byrd-Williams C, et al. Nutrition-related knowledge, attitudes, and
399 dietary behaviors among head start teachers in Texas: A cross-sectional study. *J Acad*
400 *Nutr Diet* 2013;113: 558-562.
- 401 10. Dev D, Spiers K, McBride B, et al. Head start and child care providers' motivators,
402 barriers and facilitators to practicing family style meal service. *Early Child Res Q* 2014;
403 29: 649-659.
- 404 11. Vaughn AE, Ward DS, Fisher JO, et al. Fundamental constructs in food parenting
405 practices: a content map to guide future research. *Nutr Rev* 2016; 74:98-117.
- 406 12. Johnson SL. Developmental and environmental influences on young children's vegetable
407 preferences and consumption. *Adv Nutr* 2016; 7: 220S-231S.
- 408 13. Rollins BY, Savage JS, Fisher JO, et al. Alternatives to restrictive feeding practices to
409 promote self-regulation in childhood: a developmental perspective. *Pediatr Obes* 2016.
410 doi 10.1111/ijpo.12071.
- 411 14. Shloim N, Edelson LR, Martin N, et al. Parenting styles, feeding styles, feeding practices,
412 and weight status in 4-12 year-old children: a systematic review of the literature. *Front*
413 *Psychol* 2015; 6: 1849.
- 414 15. Gable S, Lutz S. Nutrition socialization experiences of children in the head start program.
415 *J Am Diet Assoc* 2001; 101: 572-577.
- 416 16. Ventura A, Birch L. Does parenting affect children's eating and weight status? *Int J*
417 *Behav Nutr Phys Act* 2008; 5:15.
- 418 17. Birch L, Marlin D, Rotter J. Eating as the "means" activity in a contingency: effects on
419 young children's food preferences. *Child Dev* 1984; 55: 432-439.
- 420 18. Newman J, Taylor A. Effect of a means: end contingency on young children's food
421 preferences. *J Exp Child Psychol* 1992; 64: 200-216.
- 422 19. Hertzler A. Children's food patterns – A review. *J Am Diet Assoc.* 1983; 83, 555-560.
- 423 20. Fisher J, Birch L. Maternal restriction of young girls' food access is related to intake of
424 those foods in an unrestricted setting. *FASEB J* 1996;10: A225.
- 425 21. Hennessy E, Hughes SO, Goldberg JP, et al. Permissive parental feeding behavior is
426 associated with an increase in intake of low-nutrient-dense foods among American
427 children living in rural communities. *J Acad Nutr Diet* 2012;112: 142-148.
- 428 22. Birch L, Birch D, Marlin D, et al. Effects of instrumental eating on children's food
429 preferences. *Appetite* 1982; 3:125-134.
- 430 23. Black M, Aboud F. Responsive feeding is embedded in a theoretical framework of
431 responsive parenting. *J Nutr* 2011; 141: 490-494.
- 432 24. Johnson S. Improving preschooler's self-regulation of energy intake. *Pediatrics* 2000;
433 106:1429-35.
- 434 25. Tovar A, Vaughn A, Fallon M, et al. Provider's response to child eating behaviors: a
435 direct observation study. *Appetite* 2016; 105: 534-541.
- 436 26. Golan M, Crow S. Parents are key players in the prevention and treatment of weight-
437 related problems. *Nutr Rev* 2004; 62: 39-50.

- 438 27. Crockett S, Sims L. Environmental influences on children's eating. *JNEB* 1995; 27: 235-
439 249.
- 440 28. Freedman MR, Alvarez KP. Early childhood feeding: assessing knowledge, attitude, and
441 practices of multi-ethnic child-care providers. *J Am Diet Assoc* 2010;110: 447-451.
- 442 29. Lumeng J, Kaplan-Sanoff M, Shuman S, et al. Head start teachers' perceptions of
443 children's eating behavior and weight status in the context of food scarcity. *JNEB* 2008;
444 40: 237-243.
- 445 30. Hughes C, Gooze R, Finkelstein D, et al. Barriers to obesity prevention in head start.
446 *Health Aff* 2010; 29: 454-62.
- 447 31. Bronfenbrenner, U. *The Ecology of Human Development: Experiments in Nature and*
448 *Design*. Harvard University Press: Cambridge, MA, 1979.
- 449 32. Bandura, A. *Self-efficacy: The Exercise of Control*. MacMillan: New York, NY, 1997.
- 450 33. Rosenstock I, Strecher V, Becker M, et al. Social learning theory and the health belief
451 model. *Health Educ Q* 1988; 15:175-183.
- 452 34. Bleich S, Bennett W, Gudzone K, et al. Impact of physician BMI on obesity care and
453 beliefs. *Obesity* 2012; 20: 999-1005.
- 454 35. Crawford P, Gosliner W, Strode P, et al. Walking the talk: fit WIC wellness programs
455 improve self-efficacy in pediatric obesity prevention counseling. *Am J Public Health*
456 2004; 94: 1480-1485.
- 457 36. Administration for the Office of Children and Families. Office of Head Start. 2013.
458 Available at <https://www.acf.hhs.gov/ohs> Last Accessed April 14, 2014.
- 459 37. Gooze R, Hughes C, Finkelstein D, et al. Reaching staff, parents, and community
460 partners to prevent childhood obesity in head start. *Prev Chronic Dis* 2010; 7: A54
- 461 38. Whitaker R, Becker B, Herman A, et al. The physical and mental health of head start
462 staff: the Pennsylvania head start staff wellness survey, 2012. *Prev Chronic Dis* 2013. doi
463 <http://dx.doi.org/10.5888/pcd10.130171>.
- 464 39. Whitaker R, Orzol M. Obesity among US urban preschool children: relationships to race,
465 ethnicity, and socioeconomic status. *Arch Pediatr Adolesc Med* 2006; 160: 578-584.
- 466 40. Rhode Island Department of Education. Rhode Island Department of Education Child and
467 Adult Care Food Program. Available at
468 [http://www.ride.ri.gov/Portals/2/Uploads/Documents/CACFP%20Resources/CACFP%20](http://www.ride.ri.gov/Portals/2/Uploads/Documents/CACFP%20Resources/CACFP%20New%20Meal%20Pattern/CACFP_childmealpattern.pdf)
469 [New%20Meal%20Pattern/CACFP_childmealpattern.pdf](http://www.ride.ri.gov/Portals/2/Uploads/Documents/CACFP%20Resources/CACFP%20New%20Meal%20Pattern/CACFP_childmealpattern.pdf) Last Accessed March 31, 2014.
- 470 41. United States Department of Agriculture. Choose My Plate. 2014. Available at
471 <http://www.choosemyplate.gov/> Last Accessed August 2, 2014.
- 472 42. National Cancer Institute. Fruit and Vegetable Screeners in the Eating at America's Table
473 Study. 2013. Available at
474 <http://appliedresearch.cancer.gov/diet/screeners/fruitveg/validity.html> Last Accessed
475 March 31, 2014.
- 476 43. Thompson F, Subar A, Smith A, et al. Fruit and vegetable assessment: performance of 2
477 new short instruments and a food frequency questionnaire. *J Am Diet Assoc* 2002;
478 102:1764-72.
- 479 44. Ward D, Hales D, Haverly K, et al. An instrument to assess the obesogenic environment
480 of child care centers. *Am J Health Behav* 2008; 32: 380-386.
- 481 45. Landis R, Koch G. The measurement of observer agreement for categorical data.
482 *Biometrics* 1977; 33: 159-174.

- 483 46. Ward D, Mazzucca S, McWilliams C, et al. Use of the environment and policy
484 evaluation and observation as a self-report instrument to measure nutrition and physical
485 activity environments in child care settings: validity and reliability evidence. *Int J Behav*
486 *Nutr Phys Act* 2015; 12:124.
- 487 47. Dev D, McBride B, Speirs K, et al. Predictors of head start and child care providers'
488 healthful and controlling feeding practices with children aged 2 to 5 years. *J Acad Nutr*
489 *Diet* 2014; 114: 1396-1403.
- 490 48. Hughes SO, Patrick H, Power T, et al. The impact of child care providers' feeding on
491 children's food consumption. *J Dev Beh Pediatr* 2007; 28: 100-107.
- 492 49. Fallon M, Halloran K, Gorman K, et al. Self-reported and observed feeding practices of
493 Rhode Island head start teachers: knowing what not to do. *Appetite*. Manuscript
494 submitted for publication.
- 495 50. Briesch A, Chafouleas S, Riley-Tilman TC. *Direct Behavior Rating*. Guilford
496 Publications: New York, NY, 2016
- 497 51. Wickstrom G, Bendix T. The "Hawthorne" Effect: What did the original Hawthorne
498 studies actually show? *Scand J Work Environ Health* 2000; 26: 363-367. Dev D, McBride
499 B. Academy of Nutrition and Dietetics benchmarks for nutrition in child care 2011: are
500 child care providers across contexts meeting recommendations? *J Acad Nutr Diet* 2013;
501 113: 1346-1353.
- 502 52. Dev D, McBride B. Academy of Nutrition and Dietetics benchmarks for nutrition in
503 child care 2011: Are child care providers across contexts meeting recommendations? *J*
504 *Acad Nutr Diet* 2013; 113: 1346-1353.
- 505 53. Carraway-Stage V, Hensen S, Dipper A, et al. Understanding the state of nutrition
506 education in the head start classroom: A qualitative approach. *J Health Educ* 2013; 45:
507 52-62.
- 508 54. Archer E, Hand GA, Blair SN. Validity of U.S. nutritional surveillance: national health
509 and nutrition examination survey caloric energy intake data, 1971-2010. *PLoS ONE*
510 2013. doi 10.1371/journal.pone.0076632
- 511 55. Parmenter K, Ward J. Development of a general nutrition knowledge questionnaire for
512 adults. *Eur J Clin Nutr* 1999; 53: 298-308.
- 513 56. Menard S. *Handbook of Longitudinal Research: Design, Measurement and Analysis*.
514 Elsevier: Boston, MA, 2007.