



“I Just Try to Keep Her Quiet and Happy” The Role of Caregiver Feeding Practices in Early Childhood Obesity Prevention

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"I JUST TRY TO KEEP HER QUIET AND HAPPY"
THE ROLE OF CAREGIVER FEEDING PRACTICES
IN EARLY CHILDHOOD OBESITY PREVENTION

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The Harvard T.H. Chan School of Public Health
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in the Department of Nutrition
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The Role of Caregiver Feeding Practices in Early Childhood Obesity Prevention

Abstract

Children’s diet is a key driver of childhood obesity, and thus understanding the role of caregivers in mediating the frequency and content of foods offered to children is critical to developing population-based interventions to support healthy behaviors. The main objective of this thesis is to describe multi-ethnic caregiver feeding practices in the context of childhood feeding recommendations through three studies.

The first study presents cross-sectional survey data on the feeding practices of n=166 infant/toddler child care providers serving minority children in Boston, examining their adherence to current feeding guidelines. In multivariable analysis, center Child and Adult Care Food Program (CACFP) participation was associated with providers sitting with children at meals (OR=5.2; 95% CI 1.2-21.7), offering fruits and vegetables (OR=3.3; 95% CI 1.7-6.2), and limiting fast food (OR=3.5; 95% CI 1.8-6.7). These findings suggest that CACFP participation may encourage positive feeding behaviors among child care providers.

Next, using qualitative in-depth interview data (n=47) low-income multi-ethnic caregivers’ conceptualizations of preschoolers’ snacking in the context of television (TV) viewing are described. Using schema theory to frame data analysis, interview transcripts were coded using the constant comparative method and emergent themes identified. TV viewing was an important component of caregivers’ schemas around child snacking, as they were aware of and accommodated preschoolers’ snacking and TV viewing which was described as routine, positive, and useful for non-nutritive purposes such as family bonding and managing children’s behavior.

Finally, cross-sectional survey data from n=271 low-income parents of multi-ethnic children (2-12 years) is presented to identify both reasons and frequency that children receive snacks and the association between these reasons and children’s diet. Using multivariate logistic regression, children were significantly less likely to adhere to dietary recommendations (e.g. soda, fruit/vegetable consumption) when parents offered snacks for non-nutritive reasons like rewarding behavior (OR=0.83; 95% CI 0.70-0.99), celebrating events/holidays (OR=0.72; 95% CI 0.52-0.99), or achievements (OR=0.82; 95% CI 0.68-0.98). For caregivers/parents, public health messages should encourage “screen free” snacking, healthy snack options, and guidance for managing children’s behavior without using snacks or TV. Future research should explore ways to promote child-centered feeding practices both in child care and at home.

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CHAPTER 1

Paper #1: Child-care provider adherence to infant and toddler feeding recommendations:
Findings from the Baby Nutrition and Physical Activity Self-Assessment for Child Care
(Baby NAP SACC) study

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ABSTRACT

Background: Identifying characteristics associated with the Institute of Medicine's (IOM) recommended feeding practices among infant and toddler care providers in child-care centers could help in preventing childhood obesity.

Methods: In 2009, at baseline in a pilot intervention study 29 licensed Massachusetts child-care centers with at least 50% of enrolled children identified as racial minorities, 57 infant and 109 toddler providers completed feeding questionnaires. To assess provider adherence to 6 IOM-recommended behaviors, we used cluster-adjusted multivariable logistic regression models including provider type (infant or toddler), race, education, and center Child and Adult Care Food Program (CACFP) participation.

Results: In multivariable analysis, CACFP participation was associated with providers sitting with children at meals (OR 5.2; CI 1.2-21.7), offering fruits and vegetables (OR 3.3; CI 1.7-6.2), and limiting fast food (OR 3.5; CI 1.8-6.7). Providers at centers serving meals family style were less likely to allow children to leave food unfinished (OR 0.27; CI 0.09-0.77). Infant providers were more likely than toddler providers to sit with children at meals (OR 6.98; CI 1.51-32.09), allow children to eat when hungry (OR 3.50; CI 1.34-9.16), and avoid serving sugary (OR 8.74; CI 3.05-25.06) or fast foods (OR 11.56; CI 3.20-41.80).

Conclusions: CACFP participation may encourage IOM-recommended feeding practices among infant and toddler providers. Child-care providers may benefit from education about how to feed infants and toddlers responsively, especially when offering foods family style. Future research should explore ways to promote child-centered feeding practices, while addressing barriers to providing children with nutrient-rich foods.

INTRODUCTION

In recent decades the prevalence of childhood obesity in the United States has increased threefold among even the youngest children.¹ Despite recent plateaus in the prevalence of childhood obesity, nearly one in ten children under the age of 24 months still exceeds the 95th percentile of weight-for-length, and the threat to child health remains a significant concern.²⁻⁴ Children who experience rapid weight gain prior to entering elementary school are more likely to be overweight or obese later in life, especially if they are African American, Latino/a, or come from low-income families.⁵⁻⁷

Seventeen percent of American children ages birth to 2 years spend time in center-based child care, making it the most utilized form of child care outside of the home.⁸ In 2011, the Institute of Medicine (IOM) released a comprehensive report outlining evidence-based recommendations for preventing obesity in early child-care settings serving children aged 0-5 years.⁹ The IOM report identified two overarching nutrition-related goals for obesity prevention in child care: 1) Promote the consumption of a variety of nutritious foods, and encourage and support breastfeeding during infancy, and 2) Create a healthy eating environment by being responsive to children's hunger and fullness cues.⁹

Responsive feeding refers to caregiver behaviors that encourage children to self-regulate their food intake or allowing children to leave food unfinished.⁹⁻¹¹ For exclusively breast or bottle-fed infants, responsive feeding might mean feeding based on an infant's cues to hunger. For weaned infants and toddlers, responsive feeding practices may include allowing children to leave food unfinished or serving meals family style so children may choose which foods they would like to eat. The IOM recommends children begin self-serving foods family style, defined as, "allowing children to serve themselves when serving from common bowls" by one year of

age in child-care settings.⁹ Non-responsive feeding practices, such as urging children to eat more or using food to control behavior, are associated with both increased food intake and increased body mass index in young children, including infants.¹⁰⁻¹⁵

Although current IOM feeding recommendations apply to all children aged 0-5, we hypothesized that providers caring for infants (aged < 1 year) may practice more recommended behaviors than teachers caring for toddlers (aged 1-2 years), due to infants' developmental needs requiring more attentive feeding and lower state-mandated caregiver-to-child ratios for infants compared with toddlers.¹⁶ The IOM report called for enhanced training of early child-care providers, but since there are few studies describing feeding practices of providers serving children younger than two years, it is difficult to identify specific areas for training support.¹⁷ In qualitative studies, child-care providers indicate a desire to support healthy growth in children, but report often feeling ill-prepared to carry out recommendations.^{18,19} Additionally, the extent to which center-level factors may influence individual overall provider feeding practices remains unknown.

The purpose of this paper is to describe self-reported infant and toddler feeding practices among child-care center providers at licensed centers in Massachusetts serving racially and ethnically diverse children just before release of the IOM recommendations. Specifically, we explored individual and center-level characteristics that were associated with adherence to IOM recommendations along with differences in feeding practices among child-care staff caring for infants versus toddlers in order to identify age-specific training needs. Although physical activity, screen time, and sleep are all important aspects of obesity prevention in early child-care settings, our paper focuses on nutrition and feeding practices.²⁰⁻²³

METHODS

Participants and Study Design

This paper presents cross-sectional baseline data collected in the spring of 2009 from an exploratory pilot intervention study called "Baby NAP SACC (Nutrition and Physical Activity Self-Assessment for Child Care)", an extension of the existing Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) program.^{24,25} The Baby NAP SACC study was a randomized controlled trial to create healthier environments in child-care centers serving a racially and ethnically diverse sample of young children under 24 months of age. The six-month-long intervention took place in 32 licensed child-care centers (16 intervention; 16 control) located in the Greater Boston area with enrollment of minority children at 50% or greater. A total of 29 centers provided baseline data used in this study. Although a small number of Head Start centers were identified through randomization and contacted, none participated in the intervention. Detailed information about the study and recruitment procedures is described elsewhere.²⁶ During the baseline visit, trained research assistants blinded to treatment assignment distributed questionnaires to infant and toddler providers and to center directors, and they measured the center environments. The Human Subjects Committee of Harvard Pilgrim Health Care approved this study.

Measures

Primary outcomes. To assess the feeding practices of care providers as part of the pilot intervention, we used the Infant Feeding Style Questionnaire (IFSQ) and Toddler Feeding Questionnaire (TFQ), the only validated instruments used for assessing caregiver feeding of infants and toddlers available at the time.^{15,27} Since both tools were originally designed for use with parents, some questions were adapted slightly for use with child-care providers, replacing

“my child”, with “infants” or “toddlers.” Most items were identical for the infant and toddler versions of the questionnaires (e.g., “I sit down with each (infant/toddler) while she/he is eating”) and providers rated agreement on a scale of 1-5 (1-Disagree, 3-Neutral, 5-Agree). A score of 4 or greater was categorized as agreement with a statement of a recommended behavior, or disagreement with a statement of a discouraged behavior if an item was reverse coded. A brief demographic section was included with the IFSQ and TFQ collecting provider age, race/ethnicity, education, and years of experience in child care. For infant and toddler classroom providers, implied consent was obtained through completion of the survey. Reliability of the measures as assessed by Cronbach's alpha were at acceptable levels of 0.69 for the IFSQ and 0.77 for the TFQ.

The IFSQ and TFQ assessed 14 feeding practices which described caregivers' usual mealtime behaviors. Of these 14, 6 were selected as primary outcomes based on their representativeness of the two IOM goals for feeding that could be assessed across both age groups. We included 3 outcomes related to promotion of nutritious foods: provider offers fruit and vegetables daily, avoids serving fast food, avoids serving sugary foods and desserts; and 3 related to creating a responsive eating environment: provider allows children to eat when they are hungry, sits down with children during mealtime, allows children to leave food unfinished.⁹

Center level characteristics. Center directors provided written, informed consent to participate in the study and completed baseline questionnaires, which included items assessing center enrollment (i.e. number of children, ages of children, race/ethnicity of children), center participation in various programs (i.e. Child and Adult Care Food Program (CACFP)), and historical information (i.e. staff attrition, years in operation). The questionnaire included an item about food service, with family style feeding identified using the Environment and Policy

Assessment and Observation (EPAO) instrument's definition of as meals/snacks served "family style (children serve themselves)," distinct from "delivered and served on prepared trays," or "delivered in bulk and portioned by staff."²⁸ After using the EPAO tool to conduct on-site visits to validate director report of family style meal service, we found the correlation between the two was moderately strong (Spearman $r = 0.45$).

Data Analysis

To describe characteristics of child-care centers and providers, we obtained frequencies for categorical variables, and means and standard deviations for continuous variables. To assess differences in infant and toddler provider response frequencies across 14 feeding practices, cluster-adjusted chi-squared tests for categorical variables were used, accounting for center-level variation. Missing data accounted for fewer than 5% of observations, with provider age being the only anomaly (15% missing), likely because it was at the end of questionnaires.

To identify characteristics associated with provider adherence to 6 primary outcomes, we used multivariable logistic regression models adjusted *a priori* for provider race, education, provider type (infant or toddler), and CACFP participation, based on existing research suggesting their probable influence on child feeding practices.²⁹⁻³¹ We controlled for center-level variation within providers at the same centers by adjusting for clustered errors by center. We report odds ratios and 95% confidence intervals. All data analyses were conducted using Stata 12 (Stata Corporation, College Station, TX).

RESULTS

Demographic characteristics of child-care centers (n=29) and infant and toddler care providers (n=166) are presented in Table 1. There were no substantial differences in demographic characteristics between infant and toddler providers. Overall, the majority of care

Table 1. Baseline characteristics of 166 child-care providers from 32 child-care centers participating in the Baby Nutrition and Physical Activity Self-Assessment for Child Care pilot intervention in 2009

Child-Care Providers	(n = 166)
Infant ^a care provider, N (%)	57 (34.3)
Toddler ^b care provider, N (%)	109 (65.7)
Age in years, mean (SD)	32.2 (10.9)
Race (%)	
White	60.5
Black/African American	15.6
Latino/Latina/Hispanic	17.0
Education completed (%)	
High school education or less	19.2
Some college/college degree	63.6
Some graduate school or graduate degree	17.2
Years working at current center, mean (SD)	4.5 (4.5)
Years working in child care field, mean (SD)	7.2 (5.1)
Child-Care Centers	(n = 32)
Years center in operation, mean (SD)	13.5 (8.6)
Staff attrition in past 12 months (%)	20.9
Number of children enrolled, mean (range)	81 (20-590)
Race/ethnicity of children enrolled (%)	
White	48.1
Black/African American	17.5
Latino/Latina/Hispanic	14.9
Mixed race	8.3
Accepts government subsidized slots, N (%)	26 (81.3)
Participates in CACFP, N (%)	8 (25.0)
NAEYC accredited, N (%)	13 (40.6)
Food served family style at meals, N (%)	76.7
^a Infant defined as child <1 year of age, ^b Toddler defined as child ≥ 1 and < 3 years of age SD, standard deviation; CACFP, Child and Adult Care Food Program; NAEYC, National Association for the Education of Young Children; EPAO, Environment and Policy Assessment and Observation Instrument score out of 100 total points	

providers were female (98%), had some college education (64%), and worked in child care for less than ten years (67%). The majority of providers identified as White (61%), with 17% as Latino/a or Hispanic and 16% as Black/African American. Across 29 centers, 8 (28%) participated in CACFP and 13 (45%) were accredited by the National Association for the Education of Young Children (NAEYC), with only 6 (20%) participating in both programs. Many centers, 77%, reporting serving meals family style.

Table 2 shows center-adjusted differences in 14 self-reported feeding practices between infant and toddler care providers. Infant providers were more likely than toddler providers to report that they allowed children to eat when they were hungry (82% vs. 54%; $P < 0.001$), sat with children during meals (95% vs. 73%; $P < 0.05$), and continued to offer a new food after a child initially disliked it (87% vs. 65%; $P < 0.01$). Though both infant and toddler providers stated that they offered fruits and vegetables daily (69% vs. 70%; $P = 0.90$), fewer reported allowing children to decide how much to eat at meals (51% vs. 46%; $P = 0.57$).

Toddler providers reported more IOM-discouraged feeding practices than infant providers, including trying to get children to finish their food (78 vs. 68%; $P = 0.21$), encouraging children to eat in the absence of hunger (54% vs. 26%; $P < 0.01$), pressuring a child to try a disliked food during a meal (79% vs. 56%; $P < 0.05$), providing dessert as a reward for finishing a meal (27% vs. 11%; $P < 0.01$), and offering sugary foods (52% vs. 13%; $P < 0.01$) or fast foods (48% vs. 9%; $P < 0.01$). Few providers (<10%) reported watching TV while feeding children. Although infant providers adhered to more of the IOM recommendations than toddler providers, some still reported propping infants up to bottle-feed themselves (29%) and providing cereal mixed into bottles (23%).

Table 2. Differences in self-reported child-care provider feeding practices, according to age of child, among 166 providers at 32 child-care centers participating in the Baby Nutrition and Physical Activity Self-Assessment for Child Care pilot intervention

	Infant^a care providers (n=57)	Toddler^b care providers (n=109)	
Practice recommended by IOM	Agree ^c n (%)	Agree n (%)	<i>P</i> value ^d
I allow each (infant/toddler) to eat when she/he is hungry	45 (81.8)	57 (53.8)	< 0.001
I let each (infant/toddler) decide how much to eat	29 (50.9)	49 (46.2)	0.57
I sit down with each (infant/toddler) while she/he is eating	53 (94.6)	77 (73.3)	0.02
If an (infant/toddler) will not try a new food I've given her/him, I will try it again with her/him later on	46 (86.8)	88 (64.8)	0.006
I make sure each (infant/toddler) eats fruits and vegetables every day	38 (69.1)	73 (70.2)	0.90
Practice discouraged by IOM	Agree n (%)	Agree n (%)	<i>P</i> value
I watch TV while feeding (infants/toddlers)	3 (5.4)	9 (8.6)	0.62
I try to get each (infant/toddler) to finish her/his food	38 (67.9)	82 (77.4)	0.21
I try to get each (infant/toddler) to eat even if she/he seems not hungry	15 (26.3)	55 (53.9)	0.005
I offer (infants/toddlers) a sweet like ice cream, cookies, or cake if they finish their food	6 (11.1)	29 (27.1)	0.05
I let (infants/toddlers) eat fast food	5 (8.9)	49 (47.6)	< 0.001
I let (infants/toddlers) eat sugary food, like candy, ice cream, cakes or cookies	7 (12.5)	53 (52.0)	< 0.001
If (infants/toddlers) will not try a new food, I will work hard to have her/him try it during that meal	32 (56.1)	83 (79.1)	0.01
When infants have bottles, I sometimes prop them up	15 (28.9)	NA	-
I give infants cereal in the bottle	12 (22.6)	NA	-

^a Infant defined as child <1 year of age, ^b Toddler defined as child ≥ 1 and < 3 years of age

^c Participants rated their agreement with item on a scale of 1-5. (≥4 indicates agreement with statement of a recommended practice, or disagreement with statement of a discouraged practice when reverse coded)

^d Chi-squared test comparing self-reported feeding practices among infant v. toddler providers, adjusted for center-level clustering

IOM, Institute of Medicine

Table 3 presents the results of multivariable logistic regression for 6 of the 14 feeding practices which were selected based on their representativeness of the IOM feeding guidelines. Being an infant versus toddler care provider was associated with allowing children to eat when hungry (OR 3.5; CI 1.3-9.2), sitting with children at meals (OR 7.0; CI 1.5-32.1), and limiting child access to fast food (OR 11.6; CI 3.2-41.8) and sugary foods (OR 8.8; CI 3.0-25.1). Provider-specific characteristics, such as age, race/ethnicity, years of experience, and level of education were largely unrelated to these outcomes, with two exceptions. When compared to African American or Latino providers, White providers were more likely to let children leave food unfinished (OR 4.3; CI 1.2-16.0) and providers with a high school education or less were less likely to feed children only when hungry (OR 0.32; CI 0.1-0.9).

Table 3. Individual and center-level characteristics associated with Institute of Medicine recommended feeding practices for 166 providers caring for infants and toddlers from 29 child-care centers participating in the Baby Nutrition and Physical Activity Self-Assessment for Child Care pilot intervention, using multivariable adjusted models^a

	Practicing Responsive Feeding			Increasing Healthy Eating		
	Allows children to eat when they are hungry (n=102)	Sits down with children during mealtime (n=130)	Allows children to leave food unfinished (n=120)	Offers fruit and vegetables to children daily (n=111)	Avoids serving fast food to children (n=105)	Avoids serving sugary foods and desserts to children (n=98)
Child-Care Provider (n=166)	AOR ^a (95% C.I.)	AOR (95% C.I.)	AOR (95% C.I.)	AOR (95% C.I.)	AOR (95% C.I.)	AOR (95% C.I.)
Age in years	0.99 (0.96, 1.03)	1.04 (0.98, 1.09)	1.00 (0.95, 1.05)	1.02 (0.98, 1.06)	0.99 (0.95, 1.02)	1.00 (0.97, 1.04)
Years of experience						
Working at current center	1.04 (0.95, 1.13)	1.09 (0.99, 1.21)	1.05 (0.97, 1.14)	1.08 (0.97, 1.19)	0.95 (0.86, 1.05)	0.95 (0.86, 1.04)
Working in child care field	1.04 (0.95, 1.14)	1.06 (0.96, 1.16)	1.04 (0.98, 1.10)	1.01 (0.94, 1.09)	0.96 (0.89, 1.04)	1.01 (0.91, 1.12)
Provider type						
Toddler care provider	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Infant care provider	3.50 (1.34, 9.16)	6.98 (1.51, 32.09)	1.54 (0.70, 3.38)	1.00 (0.40, 2.54)	11.56 (3.20, 41.80)	8.74 (3.05, 25.06)
Race/ethnicity						
White	1.59 (0.56, 4.47)	0.78 (0.23, 2.72)	4.30 (1.16, 15.96)	1.81 (0.68, 4.33)	0.83 (0.24, 2.83)	1.32 (0.30, 5.83)
Black	1.10 (0.41, 2.99)	1.61 (0.49, 5.26)	0.22 (0.07, 0.70)	0.63 (0.30, 1.32)	1.26 (0.41, 3.81)	0.69 (0.20, 2.40)
Latino/Latina/Hispanic	0.29 (0.08, 1.04)	2.51 (0.42, 15.20)	2.31 (0.36, 14.92)	0.58 (0.17, 1.96)	2.12 (0.41, 0.94)	1.47 (0.33, 6.54)
Education						
Greater than high school education	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
High school education or less	0.32 (0.11, 0.86)	1.18 (0.45, 3.09)	0.56 (0.13, 2.37)	1.18 (0.40, 3.51)	0.70 (0.20, 2.49)	0.36 (0.10, 1.27)

(continued on Page 12)

Table 3. Individual and center-level characteristics associated with Institute of Medicine recommended feeding practices for 166 providers caring for infants and toddlers from 29 child-care centers participating in the Baby Nutrition and Physical Activity Self-Assessment for Child Care pilot intervention, using multivariable adjusted models^a (continued)

Child-Care Center (n=29)	Allows children to eat when they are hungry (n=102)	Sits down with children during mealtime (n=130)	Allows children to leave food unfinished (n=120)	Offers fruit and vegetables to children daily (n=111)	Avoids serving fast food to children (n=105)	Avoids serving sugary foods and desserts to children (n=98)
Years center in operation	1.03 (0.99, 1.08)	0.99 (0.94, 1.03)	1.00 (0.95, 1.05)	1.03 (1.00, 1.07)	1.02 (0.98, 1.06)	0.97 (0.91, 1.03)
Staff attrition >20% in past 12 months ^b	1.55 (0.73, 3.26)	0.74 (0.23, 2.37)	1.53 (0.58, 3.99)	1.83 (0.84, 4.02)	1.64 (0.69, 4.54)	0.59 (0.18, 1.84)
Enrollment						
Enrollment of > 70 children ^b	1.60 (0.84, 3.06)	0.71 (0.28, 1.80)	1.37 (0.57, 3.28)	1.31 (0.67, 2.56)	1.43 (0.57, 3.59)	1.06 (0.36, 3.11)
Majority of children are non-white	1.80 (0.94, 3.45)	1.86 (0.65, 5.31)	0.64 (0.28, 1.48)	0.91 (0.47, 1.75)	2.40 (1.11, 5.17)	1.94 (0.71, 5.35)
Accepts government subsidized slots	0.92 (0.44, 1.91)	1.61 (0.57, 4.57)	1.58 (0.52, 4.78)	1.84 (0.91, 3.72)	0.90 (0.32, 2.57)	3.12 (0.71, 13.74)
Food served family style at meals	0.85 (0.40, 1.77)	1.26 (0.31, 5.17)	0.27 (0.09, 0.77)	1.90 (0.89, 4.07)	3.89 (0.92, 16.49)	5.36 (1.40, 20.52)
Participates in CACFP	0.90 (0.38, 2.14)	5.17 (1.23, 21.68)	2.23 (0.96, 5.21)	3.27 (1.73, 6.19)	3.46 (1.78, 6.73)	2.66 (0.70, 10.28)
NAEYC accredited	1.28 (0.59, 2.78)	1.15 (0.44, 3.05)	1.03 (0.44, 2.38)	1.38 (0.77, 2.45)	1.33 (0.52, 3.41)	1.17 (0.42, 3.21)

^a Adjusted for provider race, education, age group of children served (infants versus toddlers) and Child and Adult Care Food Program participation, controlling for center-level clustering using a multivariable logistic regression model ^b Median split
CACFP, Child and Adult Care Food Program; NAEYC, National Association for the Education of Young Children

Center-specific characteristics were associated with providers' reported feeding practices. Providers at CACFP-participating centers were more likely to sit with children at meals (OR 5.2; CI 1.2-21.7), offer fruits and vegetables daily (OR 3.3; CI 1.7-6.2), and limit children's access to fast food (OR 3.5; CI 1.8-6.7). Providers at centers serving meals family style were less likely to allow children to leave food unfinished (OR 0.3; CI 0.1- 0.8) but more likely to limit the service of sugary foods (OR 5.4; CI 1.4-20.5). Centers serving a majority of non-White children (>60%) were more likely to limit the service of fast food to infants and toddlers (OR 2.4, CI 1.1-5.2). Center years of operation, enrollment size, acceptance of government subsidized slots, provider staff attrition, and center NAEYC accreditation were not associated with the primary outcomes after adjusting for the *a priori* covariates.

DISCUSSION

To our knowledge, no other studies have described infant and toddler-specific feeding practices in child care, with recent studies focusing on children two years and older, or general feeding practices across groups of children aged 0-5 years.^{31,32} Using the 2011 IOM recommendations for feeding in child care as a benchmark, we found that center participation in CACFP was associated with multiple recommended feeding practices among infant and toddler providers, including being more likely to serve fruits and vegetables, less likely to offer fast food, and more likely to sit with children at meals than providers at non-CACFP centers. Since CACFP requires adherence to specified meal patterns for food reimbursement (e.g. recommended daily fruit servings), our finding that providers at CACFP centers offered better quality foods to infants and toddlers are consistent with existing literature describing CACFP centers serving children aged 2-5 years.^{29,31}

The association between CACFP participation and the practice of sitting with infants and toddlers at meals is also consistent with a study of CACFP centers serving preschoolers in Western states.³³ In addition to setting meal patterns, the United States Department of Agriculture is required to offer technical assistance to CACFP-participating centers, including staff education regarding nutrition and child feeding.³⁴ Since individual child-care providers' knowledge and beliefs are associated with corresponding feeding practices,^{17,35} greater opportunities for training and education are likely to be influential and our study suggests participation may benefit even the youngest children in care.

We found that providers working at centers with family style meal service were less likely to allow children to leave food unfinished than providers at centers serving pre-portioned meals. The practice of family style feeding of children is almost unanimously recommended by numerous health agencies such as the IOM, Academy of Nutrition and Dietetics, and American Academy of Pediatrics because most experts believe that it allows children to self-regulate their own food intake, improve motor skills, and engage with other children and staff.^{9,36-38} However, our findings with infant and toddler providers suggest that family style meal service for infants and toddlers may result in some providers encouraging children to finish all the food they have self-served.

Child-care providers have previously expressed concern about food waste, especially in the context of family style meal service, which is predominantly defined as children selecting and self-serving their food, consistent with the definition used in our study.^{39,40} One plate waste study of preschoolers served family style meals showed that the youngest children self-served larger portions and wasted more food than older children,⁴¹ although another study of preschooler snack time did not find significant food waste using family style feeding.⁴² Perhaps

concerned providers exert more pressure on children to finish their food to avoid throwing it away. Infants or toddlers may be especially vulnerable to over-serving themselves due to a lack of dexterity or understanding of proper portion sizes.³⁹ A recent qualitative study found that providers serving children aged 2-5 described development inappropriateness and the youngest children being prone to over-serving themselves as possible barriers to serving foods family style.⁴³ Another study of preschoolers in Pennsylvania found children who served themselves excessively large portions during family style meals also consumed significantly more food than children who self-served a moderate portion.³⁶ Even in the absence of overt pressure from providers, family style meal service may lead some children to inadvertently overeat, suggesting a possible need for providers to offer gentle guidance to young children who serve themselves.

Overall, a majority of both infant and toddler providers reported some non-responsive feeding practices such as encouraging children to finish all their food (infant 68%, toddler 78%) or repeatedly encouraging them to try disliked foods during a mealtime (infant 56%, toddler 79%). Qualitative studies of child-care providers reveal a desire to encourage healthy choices,⁴⁴ concerns that a child does not get enough food to eat at home,⁴⁰ or beliefs that young children will not eat enough as key motivations to encourage children to eat more.¹⁷ However, despite these nurturing motivations, caregiver feeding practices like encouraging disliked foods, negotiating, or rewarding children at mealtime have all been associated with higher weight and poorer diet quality among children and adolescents.⁴⁵⁻⁴⁸

When compared with toddler providers, infant care providers reported more recommended feeding practices and fewer discouraged feeding practices. Although IOM feeding guidelines apply equally to both groups of children, operational challenges and children's development differences must be considered. In Massachusetts, the caregiver-to-child ratio is 1:3

for infants and 1:4 for toddlers.¹⁶ With a lower staff-to-child ratio, infant care providers may be more able to adopt responsive practices such as feeding on-demand, as evidenced by infant providers being more likely than toddler providers to let children eat when hungry (82% vs. 54%).⁹ In addition, infants' developmental needs sometimes necessitate child-centered feeding, such as assistance being bottle or spoon-fed. Therefore, age of the child may also explain why more infant providers reported sitting with children at meals than toddler providers (95% vs. 73%). However, even with a lower provider-to-child ratio, some infant providers may still struggle to follow feeding guidelines. Some providers (23%) reported putting cereal in infants' bottles, a practice discouraged due to developmental inappropriateness and a possible association with excessive weight gain.^{9,49,50} Nearly 30% of infant providers also reported occasionally propping bottles up for babies to feed themselves. Propping bottles up with a blanket or towel is discouraged because it prevents an infant from turning their head from the bottle when finished and also poses a significant choking hazard.^{49,51}

Once infants begin eating solid foods, the guidelines for nutrient quality do not differ materially from toddlers – children should be consistently offered healthy foods, and unhealthy foods should be limited. Infant providers were nearly 9 times more likely to avoid serving sugary foods and 11 times more likely to avoid serving fast food to children than toddler providers. Since most infants begin consuming solids by six months of age,⁵⁰ a drawback to comparison is the smaller window of time to introduce infants to new foods when compared with toddlers. However, despite age differences, some providers still reported offering sweets (13%) and fast food (9%) to infants.

Our study has some limitations. The use of self-reported data allows for possible desirability bias among study participants. Since this was a pilot project, the child feeding

questionnaires required adaptation for use with child-care providers and no additional testing on the instrument was conducted. We attempted to mitigate these challenges by using existing validated feeding questionnaires available at the time, though there remains some question to their validity and a need for greater testing of instruments assessing infant and toddler feeding practices.⁵² Since the feeding practices of infant and toddler teachers have rarely been described in the literature, we believe it is important to present them separately, but acknowledge that there are limitations to comparing two groups with different developmental needs.

Finally, our sample did not include Head Start centers, which do serve a significant number of low-income children of color. Future studies should include Head Start centers to determine the impact of center-level policy, since these centers are more highly monitored and regulated than non-Head Start centers.⁵³ Examination of early childhood feeding practices warrants further exploration, as child-to-staff ratios and provider knowledge about the role of modeling during mealtime may also influence individual provider behavior. Future investigations should explore ways to overcome barriers to recommended feeding practices in both age groups, as well as identify nuances in family style feeding practices among providers caring for infants and toddlers.

CONCLUSIONS

Center participation in CACFP was associated with recommended feeding practices among both infant and toddler care-providers. Nutrition professionals working in early child-care settings should encourage center administrators to adopt policies that promote healthy practices and provide ongoing education to staff and parents in order to reinforce positive behaviors.^{9,54} Wherever possible, infant providers should be encouraged to bottle feed only one child at a time, possibly by staggering feeding times for babies who haven't been weaned. Center policies should

also explicitly prohibit propping bottles or putting anything into bottles other than breast milk or formula, unless otherwise indicated by a medical professional.⁹

Educational and policy approaches should also take into account realistic mealtime eating scenarios. For example, if children must be fed on a set schedule which prohibits on-demand feeding, then providers should be allowed adequate time for meals and snacks so that children may eat without being rushed to finish quickly. If provider-to-child ratios limit caregivers' ability to sit with individual children throughout an eating occasion, especially in classrooms serving toddlers, providers may still serve as role models by talking positively about and eating healthy foods in front of children.⁵⁵ Children are more likely to try new foods, like fruits and vegetables, if they see a parent or caregiver enjoying them.⁵⁶

Child-care providers may also benefit from training on best practices for feeding, especially when offering foods family style. When serving meals and snacks, providers should be instructed to offer gentle assistance to teach proper portion sizes, while still allowing children to choose how much and which items go on their plates.^{55,56} Possible responsive practices during family style feeding include physical cues such as using utensils that encourage infant or toddler-sized portions (e.g. a tablespoon instead of a ladle), or offering visual cues like showing children a plate with appropriate portions of all the foods served. The IOM report also recommends that providers give verbal cues to describe recommended portion sizes while still communicating that children may eat to fullness, such as, "You can take one spoonful, and then you can have more if you are still hungry."⁹ Future investigations in child-care settings should continue to explore ways to promote recommended feeding practices for infants and toddlers in day care settings, while addressing the demands of serving groups of children at meal and snack time.

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CHAPTER 2

Paper #2: Conditioned to eat while watching TV? Low-income caregivers' perspectives
on the role of snacking and TV viewing among preschoolers

Abstract

Objective: The purpose of the study was to describe caregivers' schemas around child snacking and television (TV) viewing, including contexts in which child snacking and TV viewing occurred, types of snacks offered, and rationales for offering snacks. These findings may be used to develop effective messages to promote healthy child snacking behaviors.

Design: Semi-structured interviews assessed caregiver conceptualizations of preschoolers' snacks, purpose of snacks, snack context, and snack frequency.

Setting: Interviews occurred in Boston, Massachusetts and Philadelphia, Pennsylvania.

Participants: 47 low-income multi-ethnic primary caregivers of children aged 3-5 years (92% female, 32% Hispanic/Latino, 34% African American) who described their child's snacking in the context of TV viewing.

Results: TV viewing was a focal domain of caregiver schemas around child snacking across racial/ethnic groups. Caregivers described snacks offered during TV viewing as largely unhealthy. Labels for TV snacks indicated non-nutritive purposes, such as "time out", "enjoyment", or "quiet." Caregivers' primary reasons for providing snacks included child's expectations, behavior management (e.g. occupy child) and social time (e.g. family bonding). Some caregivers used TV to distract picky children to eat more food. Child snacking and TV viewing were contextually paired by providing child-sized furniture ("TV table") specifically for snacking.

Conclusions: Low-income caregivers are aware of and accommodate preschoolers' snacking and TV viewing, described as routine, positive, and useful for non-nutritive purposes. Messages

to caregivers should encourage “screen free” snacking, healthy snack options, and guidance for managing children’s behavior without using snacks or TV.

Introduction

Snack foods are contributing a greater portion of calories to the diets of children than ever before.⁽¹⁾ In 2015, preschool-aged children in the United States consumed more than 30% of their total daily calories in the form of sweet or salty snacks and sugar sweetened beverages,⁽²⁾ a nearly twofold increase in consumption over the past three decades.^(3, 4) Frequent snacking has been associated with increased energy intake, poor diet quality, and other risk factors for childhood overweight and obesity.^(3, 5)

On a usual weekday, the average preschooler in the United States watches an estimated 4 hours of television (TV).⁽⁶⁾ A review of screen time among children aged 2-6 found a majority of studies (11/12) reported a significant association between adverse dietary outcomes (e.g. increased energy intake, low fruit and vegetable consumption) and TV viewing.⁽⁷⁾ Another study of 3-5 year olds found a significant positive association between eating while watching TV and consumption of desserts, sugary drinks, and snacks.⁽⁸⁾ Aside from measuring exposure to and location of screens in the home, little is known about the environment in which children are viewing TV and snacking (e.g. who is there), and to what extent caregivers are aware of and/or condoning their child’s snacking routines.⁽⁹⁻¹¹⁾ Many child eating and snacking behaviors emerge prior to school entry, suggesting a need to support caregivers of young children in establishing healthy snacking habits.⁽¹²⁾

In this qualitative analysis, in-depth interviews were used to describe low-income multi-ethnic caregivers’ schemas around preschool-aged children’s snacking and television (TV) viewing. Using schemas identified by caregivers, we identified the social and physical contexts

in which child snacking and TV viewing were paired, the types of snacks offered, and reasons caregivers offered snacks to children watching TV. We also examined differences in perspectives among non-Hispanic white, African American and Hispanic caregivers. Since low-income children of color are most likely to engage in high levels of TV consumption,⁽⁶⁾ understanding the context in which snacking occurs and how their caregivers conceptualize snacking and TV viewing is critical to developing tailored family interventions to address early childhood obesity prevention.⁽¹³⁻¹⁵⁾

Methods

Study setting and recruitment

The study was conducted in Philadelphia, Pennsylvania, and the Greater Boston Area, Massachusetts. Participants were recruited in-person and through flyers posted at Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) offices and through online forums (e.g. craigslist). Participants were invited to participate in the study if they were at least 18 years of age, a parent or primary caregiver to at least one child aged 3-5 years old, responsible for feeding the child the majority of the time, and reported a family income at or below 185% of the Federal Poverty Level, as identified by participation in or eligibility for government assistance programs such as WIC. Caregivers were excluded from study participation if their child of interest had a severe food allergy (e.g. nuts), chronic medical condition (e.g. diabetes) or developmental disorder that influenced feeding. Purposive criterion sampling was utilized to obtain an relatively equal distribution of low-income white, Hispanic/Latino(a), and African American participants. This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all study procedures were approved

by the *[name of the ethics committees removed for blinding]*. Written informed consent was obtained from all participants.

Our findings represent a secondary analysis from a larger primary qualitative study of child snacking in which a total of 60 in-depth interviews (60-90 minutes) were conducted with low-income multi-ethnic caregivers of preschool-aged children. The objective of the larger study was to identify caregivers' schemas around child snacking. A semi-structured interview guide was used to assess caregivers' conceptualizations of child snacking, purpose for giving snacks, child snacking contexts, and frequency of giving different snacks (**Figure 1**).

1. We are interested in learning more about how you think about [child's name] snack habits and what kinds of things are important when you choose snacks for [him/her]. So, to start, when I say the word "snack" what do you think of?

Follow-up questions

- What makes something a snack?
- How is it different than a meal?

2. So thinking about [child's name], why does s/he get snacks?

3. How do you decide what [child's name] eats for a snack?

Follow up questions

- What role does [child's name] have in this decision?
- Are there snacks that you like [child's name] to eat? What things do you do to try to make sure he/she eats those kinds of snacks?
- Are there snacks that you think [child's name] should eat less often? If yes, what things do you try to do to make sure he/she doesn't eat too many of those snacks?

4. How do you decide how much [child's name] eats for a snack?

Follow up questions

- What role does [child's name] have in this decision?
- What things do you do to make sure your child does not eat too much of a particular snack?

5. How do you decide when [child's name] eats a snack?

Follow up questions

- What role does [child's name] have in this decision?
- Tell me about your child's snack habits between dinner and bedtime. What does this look like?

6. In what places or situations does [child's name] usually eat snacks?

Follow up questions

- Tell me more about [name place/setting using participant phrasing]
- Who is typically there when the child has a snack in [name place/situation]?
- Why does your child have a snack in [name place/situation]?

* Questions included in this figure represent a subset from the larger interview guide.

Figure 1: Sample interview guide questions used to conduct in-depth interviews with low-income caregivers regarding child snacking*

Procedures

Interviews were conducted by trained interviewers (REB, CG, AO, YB) in either English or Spanish using interview rooms in university facilities. Upon completion of the interviews, participants completed a brief demographic questionnaire assessing caregiver age, education, income, gender, race/ethnicity, child age, number of children in household, and household food security using a 6-item short form of the U.S. Household Food Security Survey Module.⁽¹⁶⁾ Participants received public transportation fare to cover travel to the interview site and a \$45 gift card for participating in the study.

Data analysis

Interviews were digitally recorded, transcribed into their original language, and verified by each interviewer. In order to ensure contextual accuracy and allow for all data analysis to occur in English, Spanish language transcripts were translated into English and reviewed a second time by the original English-Spanish bilingual interviewer. For the primary study, an initial coding scheme of food parenting practices was developed through review of the parenting and child feeding literatures and emergent coding of five interviews, verification of interpretation of emergent themes by a second coder, and ongoing peer review of themes represented in the coding scheme by all study personnel (CB, KD, JF, REB, NY, AO). A team of three research assistants (REB, NY, AO) used this coding scheme to code all 60 transcripts in NVivo 10 (QSR International, Melbourne, Australia); research assistants did not code transcripts for the interviews that they conducted.

Among the 60 participants, a total of 47 specifically discussed TV viewing in the context of child snacking. Passages were included if they specifically described children's snacking and TV

viewing and excluded if they described TV or media in contexts unrelated to children’s snacking (e.g. child’s favorite cartoons, parent seeing snacks on TV). Although caregivers were not explicitly prompted to discuss TV viewing, the role of TV emerged spontaneously in the majority of interviews (n=47), suggesting it might be an integral component of caregivers’ schemas of child snacking. As part of the primary study, all passages in which TV was mentioned in the context of snacking were coded under the theme “TV”, which yielded sufficient data to warrant a secondary analysis.

To guide the coding of TV-related content we used the constant comparative method (CCM), a qualitative approach to data analysis which is based on grounded theory.⁽¹⁷⁾ CCM allows themes to emerge during coding rather than having a set coding scheme prior to analysis.⁽¹⁸⁾ We used schema theory as a way to frame emergent themes and categorize the TV viewing context as it relates to child snacking from the perspective of caregivers, understanding that individuals organize information about their world into schemas, or systems which inform and shape behavior.⁽¹⁹⁾ Using schema theory allowed us to describe caregiver-identified methods of classifying and categorizing child snacking behaviors using participants’ own words in a way that has been used to study child snacking in the past.⁽²⁰⁾

In order to achieve data triangulation, thematic coding of TV-related passages occurred in the context of discussion, revision, and the use of two coders (REB, CG). All transcripts were double coded and through peer debriefing discrepancies in coding were discussed at weekly meetings to clarify interpretation of coded passages and theme definitions. Finalized themes were coded and summarized and matrices run to examine themes across caregiver race/ethnicity using NVivo 10. We used SAS 9.3 (SAS Institute, Cary, NC) to generate descriptive statistics on demographic characteristics obtained from questionnaires completed by participants, including means and

frequency distributions. To assess differences in characteristics between participants who did/did not mention television we used chi-squared tests for categorical variables (e.g. race) and t-tests for continuous variables (e.g. age) using a cutoff of $P < 0.05$ for significance.

Results

Participant characteristics

Participants for this sub-study (n=47) were mostly female (92%) with a mean age of 32 years. The majority of primary caregivers were mothers (n=42, 89%), with fathers (n=3, 6%), a grandfather (n=1, 2%), and a great aunt (n=1, 2%) making up the rest of the sample.

Race/ethnicity was reflective of our original sampling and included white (n=16, 34%), African American (n=16, 34%) and Hispanic/Latino (n=15, 32%) participants. Most caregivers spoke English as their primary language (77%), with only 17% being monolingual in Spanish.

Caregivers were fairly evenly divided between being married/cohabiting with a partner (43%) or single (49%), with an average of 2 children per household. Less than half (40%) of caregivers were employed, with 45% reporting being out of work. Many caregivers reported experiencing food insecurity in the past 12 months (47%), and participating in various public assistance programs (e.g. Supplemental Nutrition Assistance Program). Most caregivers were overweight or obese (68%) based on body mass index scores calculated from self-reported weight and height. Additional demographic information can be found in **Table 4**. There were no statistically significant differences in demographic characteristics between participants who did or did not discuss TV during the interviews.

TV viewing as a distinct context for child snacking

Within the domain of child snacking in the context of TV viewing, three main themes emerged across the 47 out of 60 participant interviews who described television: caregiver

Table 4. Demographic characteristics of participants: low-income caregivers (n=60) of children aged 3-5 years from the Northeastern United States

Demographic characteristics	All interviewed		Discussed TV and snacking	
	<i>n</i>	%	<i>n</i>	%
Total participants	60	100.0	47	78.3
Sex				
Female	56	93.3	43	91.5
Male	4	6.7	4	8.5
Caregiver age in years (mean, SD)	31.2	8.4	31.9	9.2
Relationship to child				
Mother	55	91.7	42	89.4
Other	5	8.3	5	10.6
Race				
White	17	28.3	16	34.0
African American	23	38.3	16	34.0
Hispanic/Latino	20	33.3	15	31.9
Primary language(s) spoken				
Only/mostly English	45	75.0	36	76.6
Both English and Spanish equally	3	5.0	3	6.4
Only/mostly Spanish	12	20.0	8	17.0
Education				
Less than high school	10	15.0	5	10.6
High school graduate/GED	28	31.7	15	31.9
Technical school/some college	23	38.3	18	38.3
College graduate or greater	9	15.0	9	19.1
Employment				
Employed	19	35.2	17	39.5
Self employed	3	5.6	3	7.0
Out of work more than 1 year	14	25.9	11	25.6
Out of work less than 1 year	14	25.9	8	18.6
Other	4	7.4	4	9.3
Full-time student				
Yes	20	33.3	18	38.3
No	40	66.7	29	61.7
Marital Status				
Married or living with partner	23	38.3	20	42.6
Divorced/separated	5	8.3	4	8.5
Single	32	53.3	23	48.9

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Demographic characteristics	All interviewed		Discussed TV and snacking	
	<i>n</i>	%	<i>n</i>	%
Weight status ^a				
Underweight	2	3.3	1	2.1
Normal weight	17	28.3	14	29.8
Overweight	11	18.3	9	19.2
Obese	30	50.0	23	48.9
Experienced food insecurity in past 12 months ^b				
Yes	26	43.3	22	46.8
No	34	56.7	25	53.2
Participated in assistance programs				
WIC	42	70.0	33	70.2
Food Stamps/SNAP/EBT	48	80.0	38	80.9
Free/reduced school meals	28	46.7	20	42.6
Head Start	21	35.0	16	34.0
Age of child (mean, SD)	3.9	0.8	3.9	0.8
Number of children in household (mean, SD)	2	1.0	2	1.0

GED, General Education Development; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children; SNAP, Supplemental Nutrition Assistance Program; EBT, Electronic Benefit Transfer. ^a Weight status based on self-reported body mass index.

^b Assessed using 6-item short form of the United States Household Food Security Survey Module

labels/categories for child snacks consumed while watching TV, contexts in which snacking and TV viewing occurred, and caregiver-identified goals for child snacking and TV viewing.

Low-income caregivers across all racial/ethnic groups described their preschoolers' snacking in the context of TV viewing, with few differences in coding categories or domains. All parents described usual snacking and TV viewing occasions, and a majority of participants described specific scenarios in which their child ate snacks while watching TV (n=31). Child snacking and TV viewing frequently co-occurred in the context of a predictable, daily routine of the child snacking with the TV on (n=13):

“She only wants to go in front of the TV when she has snacks.” (Hispanic mother of a 4-year-old girl)

“When he’s watching like cartoons, he’ll eat snacks.” (White mother of a 3-year-old boy)

“She knows her snack-TV time” (White mother of a 4-year-old girl)

In the context of these eating episodes, some caregivers (n=10) identified that the child was distracted while consuming their snacks:

“Like, she could eat the whole little box of Oreos - just sitting there by herself like, sitting there – like, [when] she would watch cartoons.” (Hispanic mother of a 4-year-old girl)

“Snack is different from a meal because, you know, they can sit in front of the TV and eat a snack. But rather than when I feed ‘em their meal, they got to stay at the table, no TV on, no pencil and paper at the table.” (African American father of a 3-year-old boy)

Other caregivers described children expressing resistance to consuming snacks in locations away from the TV, such as the kitchen table (n=4):

“I say come sit at the table, and he won’t. He won’t sit to eat here. It’s almost as if he’s conditioned to watch TV and eat.” (White mother of a 4-year-old boy)

“Because when I serve her [snacks] . . . she doesn’t like sitting at the table, she has a blanket and there she sits on the floor and she watches TV.” (Hispanic mother of a 5-year-old girl)

Characteristics of snacks consumed by children when watching TV

More than half (n=25) of caregivers discussed specific snacks that their preschoolers consumed when watching TV. They described a broad range of snack choices offered, ranging from fruits and vegetables to cookies and chips. Caregivers used a variety of labels to describe these snacks offered during TV viewing, with categories including healthfulness of food (“good for her”; “junk food”), flavor (“things on the sweet side”), size (“something small”; “little

snacky foods”), and frequency (“foods he has on special occasions”; “things that we don’t eat so often”). Overall, more caregivers described snacks consumed when watching TV as unhealthy than healthy, with the word “junk” being used most frequently. Additionally, many caregivers used non-nutritive labels for the foods to indicate their purpose (“calm her down snacks”; “time out snacks”; “a fun little thing”).

Physical and social contexts

Caregivers often referred to the physical or environmental context in which snacking and TV viewing took place (n=17), mentioning that children frequently snacked in a room of the house where the TV was located (e.g. living room, parlor, family room). Only one participant described her child snacking in his bedroom while watching TV. Among those who described the snacking and TV viewing environment, more than half described the use of specific furniture to facilitate snacking, such as a child-sized “TV table” or “bean bag” used primarily or exclusively for eating in front of the TV:

“He eats [snacks] in front of the television. So he has this little table and chairs and usually I join him, in front of the TV.” (White mother of a 3-year-old boy)

“I pull the TV table out when she’s having snacks.” (White mother of a 4-year-old girl)

When describing the snacking and TV viewing context, many participants provided details about social situations that children experienced around snacking in front of the TV. Some participants described their child snacking by themselves (n=8), “I’m nearby, but you know, as long as I monitor it, he’s on his own.” However, more frequently, children were described as having snacks alongside other family members (i.e. parents, siblings, grandparents) or friends while watching TV (n=18). In most cases participants described themselves as the primary person participating in snacking while watching TV their child:

“I eat it with her. Like we have snack time together while we’re watching cartoons.”

(African American mother of a 4-year-old girl)

Caregiver rationales for giving children snacks while watching TV

Among those who described TV viewing and snacking, most participants (n=26) provided at least one rationale for offering their child snacks specifically when watching TV. Four key reasons were provided by caregivers: 1) children expect snacks with TV; 2) snacking and TV watching promotes social interaction; 3) behavior management; 4) to encourage intake of more food. Most caregivers provided multiple rationales for encouraging children to eat snacks while watching TV.

A primary rationale that participants gave for allowing children to have snacks and watch TV was that the TV being on prompted children to ask for expected snacks (n=13):

“So usually it’s TV and [then], ‘I want a snack,’ ” (White mother of a 4-year-old girl)

“I think they ask more for the junk foods ‘cause they see other kids eating a lot of it. You see it a lot on TV, on commercials, so they ask for it . . .” (African American mother of a 4-year-old girl)

In some cases, caregivers discussed their child requesting snacks even in the absence of hunger:

“Well, she’s just usually not hungry she’ll just say she just wants it because someone else has it. So she’ll sit in front of the TV with a bunch of apples. Like she’ll, she’ll want something like that to watch TV.” (White mother of a 4-year-old girl)

Caregivers also cited social motivation (n=11) for child snacking and TV time, describing a desire to bond and spend time as a family together. Caregivers indicated that snacks with TV helped bring family members together to form positive memories:

“We tend to sometimes have snacks together. Sit down, me and his brother, and just talk or if we’re watching a movie we’ll have a little bit of popcorn. So it’s more like a bonding type of thing for us, too.” (White mother of a 4-year-old boy)

“I think of like visiting my papa where he lives, like there’s just this cute picture of the two of them watching TV eating doughnuts . . .” (White mother of a 3-year-old girl)

“When we all seated at home in the family room to watch a movie, that’s when he asks [for snacks]. Or we may have chips, or cookies or fruits. We sit down to watch a movie together and we nibble on fruit that’s for everyone.” (Hispanic mother of a 4-year-old boy)

Additionally, caregivers described snacking and TV as a way to manage active preschoolers’ behavior, either as a way to occupy their child (n=11) or as a way to achieve some free time to do other things around the house (n=5):

“Like if I’m cleaning or something or I got some paperwork to fill out or work to do around the house I just sit him in front of the TV and he eat like, he will nibble on like fruit, vegetables, anything like that.” (African American mother of a 3-year-old girl)

“And keeping her busy is more of sitting down watching TV like the popcorn, the waters, the hard pretzels, candy and just to keep busy. . . I mean there’s really no nutrition, but it keeps her occupied.” (White mother of a 5-year-old girl)

“. . . I just to try to keep her quiet and you know kinda keep, like I said, happy. I’ll just give her a couple of cookies if she’s sitting down and relaxing and watching something.” (White grandfather of a 4-year-old girl)

A smaller number of caregivers (n=4) explained that they used TV viewing as a time to distract their child in order to get them consume more food. These caregivers all described their

preschoolers as “picky,” and felt that the distraction posed by the TV offered an important time to increase their child’s intake of healthy foods:

“I can give her the more healthy options when she’s watching TV because she’s kind of distracted by that and like, you know, not thinking of like the candy bar that she probably would want you know, if she wasn’t distracted by having the TV” (White mother of a 4-year-old girl)

“. . . it goes back to the distraction thing with him. It’s another—it’s a good way to have him, you know, enjoying the cartoons as well as getting him to have some nourishment.” (White mother of a 3-year-old boy)

Discussion

This study is the first to examine low-income caregivers’ schemas around preschoolers’ snacking and TV viewing behaviors, including contextual descriptions of child snacking episodes, caregiver-identified labels for “TV snacks,” and rationales for promoting simultaneous snacking and TV viewing among children. We found that in a subset of interviews, (n=47) TV viewing was a routine context within which preschoolers receive and consume snacks, suggesting that TV viewing was a component of low-income white, African American, and Hispanic/Latino caregivers’ schemas around child snacking. Across racial/ethnic groups, caregivers appeared to accommodate snack-TV routines by consistently offering snack foods whenever the child viewed TV or by providing child-sized eating furniture in rooms with TVs.

Although the role of TV has not previously been described, previous studies of low-income caregivers have indicated that eating occasions are considered important for child socialization and that snack foods are commonly described as tools for behavior management.^(21, 22) Our findings build upon existing literature, presenting nuanced caregiver attitudes regarding

preschoolers' snacking and TV viewing, a pairing described as routine, positive, and useful with an emphasis on non-nutritive motivations including family bonding. Low-income caregivers' feeding decisions may occur in the context of a complex interplay between balancing home life stress and environmental constraints.^(23, 24) When resources are limited, TV and low-cost snacks may be more available options for family time compared with a trip to the movie theatre.^(25, 26) Additionally, demanding jobs may lead tired caregivers to seek out positive opportunities for children to unwind quietly with a snack and cartoon program, which are perceived as educational and useful for learning English.⁽²⁷⁻³⁰⁾ Understanding these values is essential to identifying ways to support caregivers in adopting healthful practices around snacking and media use.

In our study caregivers described two key snacking and TV viewing patterns that may contribute to excessive weight gain in childhood: using food to manage behavior and encouraging children to eat in the absence of hunger, themes identified in other snack feeding literature.⁽³¹⁾ Labels used to describe the snacks eaten during TV viewing often described a desired outcome rather than nourishing attribute, such as giving a child a snack with TV for “enjoyment” or “quiet.” In children for whom TV is a prompt to eat in order to be quiet or reward behavior, increased opportunities for snacking may lead to overeating, as studies have observed some preschoolers consume large food portions without limiting their caloric intake at later meals.^(32, 33) Distracted or mindless eating while watching TV may also contribute to significantly higher intake of calories per eating episode and reduced satiety in children, possible leading to future overeating.^(34, 35)

Our findings should be considered in the context of preschoolers' potential frequency of exposure to TV snacking cues, as preschoolers watch nearly double the American Academy of Pediatrics (AAP) recommended limit of two hours daily.^(6, 36) The inherent context of TV

viewing, which includes positive social time, energy dense foods, and comfortable bean bags or TV tables may stimulate children's intake and reinforce established routines. In the past, experimental work has demonstrated that repeated cues to eating in the form of audio and visual stimuli can override children's fullness after consuming a snack and cause them to continue to consume significantly more calories than when the stimuli are not present.⁽³⁷⁾ Although a few caregivers in our study described offering healthy snack options when children viewed TV, the majority described TV viewing snacks as "junk," "fun," or "special" foods like cookies or chips. Since many of these commonly consumed snacks are energy dense,⁽³⁸⁾ pairing such foods with a routine activity like TV viewing may children's likelihood of exceeding their daily caloric needs. In addition to increased sedentary time and exposure to food marketing, it is not surprising that greater levels of TV viewing have been associated with elevated body mass index z-scores in preschoolers.⁽¹⁰⁾

To better communicate existing AAP guidelines to caregivers, more attention needs to be paid to the pairing of TV viewing and child snacking. In one study examining TV viewing among preschoolers, low-income parents reported significantly less confidence in limiting their child's TV time or finding other activities to occupy their children when compared with higher income parents.⁽²⁷⁾ Since caregiver schemas overwhelmingly included child snacking with TV viewing, messages to caregivers should encourage "screen free" snacking for children, healthy snack options, and guidance for managing children's behavior without using snacks or TV. Many caregivers reported engaging in snacking and TV viewing along with their children, and may also benefit from increased capacity building around setting an example by turning off the TV when food is served, and saving "fun" snacks for special occasions where they are appreciated.

Our study has some limitations. TV and snacking were not mentioned in all interviews, so our findings are not reflective of our entire sample and are specific to parents who engage in children's snacking and TV viewing. Due to the sample size and nature of qualitative research, our findings may not be generalizable for all low-income caregivers of preschoolers. However, one benefit of using a purposive criterion sample was our ability to examine differences in attitudes and beliefs among racial/ethnic groups and to study caregiver beliefs in-depth by using an interview format that utilized open-ended questions. Our findings regarding preschooler snacking and TV viewing were emergent, as we did not directly ask about TV in our interview guide. Thus, there may be other unmeasured attitudes/beliefs held by caregivers. Nevertheless, we believe that the frequency with which TV was mentioned across a vast majority of participants indicated that the topic was important to our population and the rich data that we obtained allowed for an informative analysis.

Previously, little had been known about the environment in which children are snacking and viewing TV and the extent to which caregivers are aware of and/or condoning these behaviors.⁽⁹⁻
¹¹⁾ Our study provides valuable insight into low-income caregivers' schemas around child snacking and helps shed light on possible areas for future inquiry. More dialogue with caregivers is needed to identify appropriate messages that address child snacking and appropriate limits on screen time. Observational studies should examine the frequency of child snacking and TV viewing in the context of parent roles and expectations. Helping caregivers identify strategies to promote healthy child snacking during TV viewing and reduce time spent snacking in front of screens may be important behavioral targets for future childhood obesity prevention interventions serving low-income families.

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CHAPTER 3

Paper #3: Reasons low-income parents offer snacks to children: how feeding rationale influences snack frequency and adherence to dietary recommendations

Abstract

Although American children snack more than ever before, the role of parents in promoting snacking is not well understood. In 2012-13 at baseline in an intervention study to prevent childhood obesity in low-income Massachusetts communities, n=271 parents of children aged 2-12 years completed surveys regarding reasons they offered children snacks, demographics, and dietary factors. We used multivariable logistic regression models to assess the cross-sectional association between reasons parents offered snacks and child adherence to dietary recommendations. Parents offered snacks (\bar{x} = mean/week; SD = standard deviation) to help children grow (\bar{x} =2.5; SD 2.2) or satisfy hunger (\bar{x} =2.4; SD 2.1) almost twice as often as they did to keep a child quiet (\bar{x} =0.7; 1.5) or celebrate events/holidays (\bar{x} =0.8; SD 1.1). However, compared with older children (6-12 years), young children (2-5 years) received more snacks for non-nutritive purposes like rewarding behavior (1.9 vs. 1.1, $P<0.001$), keeping quiet (1.0 vs. 0.5, $P<0.001$), and celebrating achievements (1.7 vs. 1.0, $P<0.001$). Children were significantly less likely to adhere to dietary recommendations when parents offered snacks for non-nutritive reasons, like rewarding behavior (OR=0.83; 95% Confidence Interval (CI) 0.70-0.99), celebrating events/holidays (OR=0.72; 95% CI 0.52-0.99), or achievements (OR=0.82; 95% CI 0.68-0.98). Parental intentions around child snacking are likely important targets for obesity prevention efforts.

1. Introduction

In the United States children aged 2-12 years are consuming snack foods more frequently[1] and in greater quantities than ever before, eating an estimated 30% of daily calories in the form of sweet and salty snacks and up to 40% when sugar sweetened beverages are considered [2,3]. Snack foods tend to be low in fiber, vitamins, and minerals and high in refined flour, sodium, and sugar [4]. Greater snacking frequency has been

associated with consumption of energy-dense foods (e.g. cookies, chips, sweets) and an increased risk for excessive weight gain in childhood [5-8]. Although large-scale public health efforts may be slowing the incidence of obesity in young children, nearly one in three American children are already overweight or obese by the time they begin elementary school [9,10]. Low-income Hispanic/Latino and African American children are disproportionately more likely than white children to experience obesity and its related complications [11,12].

Although children's snacking habits are believed to be significant in the context of obesity risk, little is known about intentions of parents in promoting child snacking [8,13]. Additionally, the knowledge gap regarding parents' snacking intentions is widest for families from low socioeconomic and racially/ethnically diverse backgrounds, where children are most likely to be overweight or obese [11,14-16]. The reasons parents offer snacks are important because they shape contexts in which children learn to eat. It has been hypothesized that non-nutritive feeding strategies which focus on outcomes unrelated to a child's growth and hunger (e.g. behavior management, rewards) may lead to children having more frequent opportunities to eat in the absence of hunger, thus limiting their ability to successfully assess their own fullness[8]. Routine use of non-nutritive feeding practices has been associated with children's increased energy intake, higher body mass index (BMI), and aversions to eating healthy foods [17-19]. Conversely, less is known about the influence of nutritive feeding purposes in which parents offer children snacks based on reasons which focus on a child's health (e.g. satiate hunger, encourage growth).

We present baseline data collected as part of a community intervention to prevent and control obesity among multi-ethnic children aged 2-12 years from predominantly low-income communities in Massachusetts. Using self-reported survey data from a sample of low-income parents of children (n=271), we present our findings based on the following research questions: 1) How frequently do parents offer snacks for nutritive and non-nutritive

purposes?; 2) What parent, child, and family-level characteristics are associated with low-income parents offering snacks to children for nutritive and non-nutritive purposes?; 3) Are parent reasons for offering snacks associated with children's adherence to obesity-related dietary recommendations? We hypothesized that parents who offered more snacks for non-nutritive reasons would be more likely to have children who fail to meet dietary recommendations related to obesity prevention. Understanding the motivation for and frequency with which parents offer snacks to children is essential to developing public health interventions that can address child snacking in the context of healthy eating.

2. Methods

2.1 Participants and study designs

This study utilizes cross-sectional baseline supplemental survey data collected between July 2012 and April 2013 from the Massachusetts Childhood Obesity Research Demonstration (MA-CORD) project, a two-year, multi-level, multi-sector community intervention to prevent and control obesity among children 2-12 years from predominantly low-income communities in Massachusetts. Detailed information about the larger study design and procedures have been published elsewhere [20,21]. Trained research assistants recruited parents onsite or by phone following a clinical visit at one of three community health centers (CHCs) in Massachusetts. Parents completed a survey on behalf of an index child and were eligible to participate if they met the following criteria: were at least 18 years old; had a child aged 2-12 years; spoke English, Spanish or Portuguese; resided in Fitchburg, New Bedford, or Lowell, Massachusetts; planned to stay at the CHC for the next 2 years. If parents had multiple age-eligible children, one child was randomly selected. If the index child had a serious nutrition or growth-related medical condition (e.g. cystic fibrosis, juvenile diabetes), the parent was excluded from the study.

Research assistants administered survey questionnaires orally in English, Spanish or Portuguese. As a supplement to the main intervention survey assessing the intervention's primary outcomes (i.e. index child's obesity-related behaviors and quality of life), parents were invited to participate in a supplemental survey that collected more specific information about child snacking, nutrition habits, and parent characteristics. Parents also consented to allow survey data to be linked with weight and height data from their child's electronic health record at the CHC. Participants received \$15 for participation. The study protocol was approved by the human subjects committees of the Massachusetts Department of Public Health, Harvard T.H. Chan School of Public Health, Massachusetts General Hospital, and Harvard Pilgrim Health Care Institute in June 2012 (#331765).

2.2 Measures

2.2.1 Reasons parents offer children snacks

To assess parent reasons for giving children snacks, we used questions developed for this study by subject matter experts (K.K.D., J.O.F.)[22]. Parents indicated the frequency with which snacks were offered for a particular reason during a typical week. A total of six reasons were assessed, including two nutritive snack feeding reasons ("To help child grow"; "Because child is hungry") and four non-nutritive reasons ("Reward for good behavior"; "To keep child quiet"; "To celebrate an event or holiday"; "To celebrate a child's achievement"). Questions were coded based on frequency of snacks offered by reason (e.g. How often do you give your child snacks as a reward for good behavior? 0=Never, 0.5 = Less than once per week, 1 = Once per week, 2 = Twice per week, 3 = Three times per week, 4 = Four times per week, 5 = Five or more times per week). See **Supplement A** for complete questionnaire text used.

2.2.2 Adherence to childhood dietary recommendations

Participants reported the frequency in the past month with which their child consumed various foods (e.g. “In the past month, on average, how often did your child drink any regular (not diet) sodas or soft drinks, including Malta or Penafiel? Would you say . . . Never, Less than once per week, One time per week, 2-4 times per week, Nearly daily/daily, 2-4 times per day, 5+ times per day?”) (**Supplement A**). Questionnaire items measuring child dietary intake were adapted from questionnaires used in previous studies. Child adherence to dietary recommendations was assessed using a binary outcome variable of adherence versus non-adherence based on six possible healthy eating behaviors selected based on their relative contributions to dietary risk of childhood obesity [6,23].

Adherence to recommendations was determined using the following evidence-based cut-offs: 1) consumed soda less than 1 time per week, 2) consumed sweetened juice drinks less than one time per week (punch, Kool-Aid®, Tampico, sports drinks), 3) limited 100% juice to one or fewer daily servings, 4) consumed fast food less than one time per week 5) consumed at least two servings/day of fresh, frozen or canned fruit, 6) consumed at least two servings/day of cooked/uncooked vegetables, excluding potatoes [6]. One point was assigned for each adherent behavior to develop a total score. This score was strongly positively correlated with items assessing the index child’s intake of the same foods and beverages on the previous day (Pearson $\rho=0.61$). The outcome of adherence was set at a score of 4 or greater out of 6 possible dietary behaviors, indicating that the child was engaging in a majority of adherent behaviors.

2.2.3 Parent, child, and family characteristics

Parents reported demographic information about themselves (relationship to child, gender, age, education, income, nativity status, language spoken, marital status), their child (age, gender, race/ethnicity), and their overall family (size of household, participation in

assistance programs, level of food insecurity). Parent race/ethnicity was not assessed separately from their child. Household food security was assessed using items from the United States Household Food Security Survey Module [24]. Child weight status was assessed using parent report of child gender and recent child weight and height measures obtained from electronic health records to obtain BMI-for-age growth percentiles using the 2000 Centers for Disease Control and Prevention cutoffs (e.g. overweight/obese: ≥ 85 th percentile, normal: ≥ 5 th and < 85 th percentile). Parent BMI (kg/m^2) was obtained using self-reported current or pre-pregnancy weight and height.

2.3 Data analysis

To describe participant characteristics we generated descriptive statistics including means, standard deviations, and frequency distributions. To assess differences in mean times per week that snacks were offered based on parent or child characteristics, we used one-way analysis of variance (ANOVA) and used least squares means to compare differences between racial/ethnic groups. We assessed adherence to dietary recommendations using multivariable logistic regression models including variables selected *a priori*, including child race, child age, child sex, child BMI z-score, parent BMI, missing parent BMI, and parent education, reporting odds ratios and 95% confidence intervals. We used SAS 9.3 (SAS Institute, Cary, NC) to conduct all statistical analyses.

3. Results

3.1 Participant characteristics

Demographic characteristics of parent participants ($n=271$), their households, and their index child are presented in **Table 5**. The majority of the 271 participating parents were female (90%) with a mean age of 32.1 years (range: 19-62). All parents were primary caregivers to the child, identifying as mothers (87%), fathers (9%), grandparents (3%), and

legal guardians (1%). Participant education was fairly evenly divided between not having completed high school (28%), having a high school-level education (38%), and having some college or technical school (30%); few parents had completed college (5%). Parents primarily reported being single (42%) or married/cohabiting with a partner (40%). A substantial number of parents were born outside the United States (44%) and spoke a language other than English (54%). Among parents who provided self-reported weight and height, most parents were overweight or obese (63%) based on BMI. Approximately 10% of parents (n=36) did not provide complete weight and height data needed to calculate BMI. Parents with missing BMI data were more likely to have lower household incomes, level of education, and children who were overweight or obese, though these differences were not statistically significant.

Table 5. Characteristics of parents of children aged 2-12 years in Massachusetts, USA (n=271)

	n	(%)
Parent characteristics		
Relationship to child		
Mother	235	86.7
Father	25	9.2
Grandparent	8	3.0
Legal guardian	3	1.1
Gender		
Female	245	90.4
Male	26	9.6
Parent age in years (mean, range)	32.1	(19-62)
Parent education		
Less than high school	75	27.7
High school graduate/GED	102	37.6
Some college or technical school	80	29.5
College graduate	14	5.2
Parent birthplace		
United States	151	55.7
Outside United States	120	44.3
Parent language spoken		
Only or mostly English	124	45.8
Equally English and another language	96	35.4
Only or mostly another language	51	18.8
Parent marital status		
Single	114	42.1
Married or living with partner	109	40.2
Separated/living apart from spouse	31	11.4
Divorced/widowed	17	6.3
Parent body mass index		
Normal	71	26.2
Overweight/obese	172	63.4
Missing	27	10.0
Family characteristics		
Household income		
≤ \$10,000	85	31.3
\$10,001 to \$15,000	48	17.7
\$15,001 to \$20,000	54	19.9
\$20,001 to \$35,000	47	17.4
> \$35,000	37	13.7
Number in household (mean, range)	4.0	(2-13)

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	n	(%)
Family food insecurity in the past 12 months		
Yes	146	53.9
No	125	46.1
Family assistance received (select all that apply)		
SNAP/EBT/food stamps	192	70.9
Free/reduced meals for child at school	188	69.4
WIC (Women Infants & Children)	103	38.0
Child characteristics		
Child age		
Preschool-aged (2-5 years)	120	44.3
Elementary (6-10 years)	114	42.1
Middle (11-12 years)	37	13.6
Child gender		
Female	120	44.3
Male	151	55.7
Child race		
Hispanic/Latino	154	56.8
White	40	14.8
Black/African American	32	11.8
Multiracial	24	8.9
Other	21	7.7
Child body mass index ^a		
Normal	152	56.1
Overweight	45	16.6
Obese	72	26.6
Child adherence to dietary recommendations ^b		
Soda (< 1 time per week)	189	70.0
Sweetened juice drinks (< 1 time per week)	80	29.5
100% juice (≤ 1 serving per day)	211	77.9
Fast food (< 1 time per week)	173	63.8
Fruit (≥ 2 servings per day)	68	25.1
Vegetables (≥ 2 servings per day)	54	19.9

GED: General Educational Development exam for high school proficiency
^aUsing 2000 CDC BMI-for-age growth percentiles calculated using parent report of child gender and weight/height measures obtained from child's electronic medical record ^bBased on parent self-report of child's intake over previous month ^c Assessed using the U.S. Household Food Security Survey Module

Overall, the participant households were very low income, with 69% reporting combined earnings below the U.S. Census poverty threshold based on the median reported household size of four people [25]. Less than 14% of households earned greater than \$35,000 annually. Most parents received some type of food assistance from programs such as the

Supplemental Nutrition Assistance Program (SNAP) (71%) or free/reduced meals for child at school (70%) and more than half reported that their household experienced food insecurity in the past year.

The majority of the children of interest were preschool (44%) or elementary school-aged (42%) compared with middle school-aged (14%). Parents reported on male children (56%) slightly more frequently than female children (44%). More than half of children were identified by parents as being Hispanic/Latino (57%), followed by white (15%), black/African American (12%), multiracial (9%), and of another racial/ethnic group (8%). There were slightly more normal weight children (56%) compared with overweight (17%), obese (27%), or underweight (1%). A majority of children met dietary recommendations for consumption of soda (70%), 100% fruit juice (78%), and fast food (64%); fewer children met guidelines for consuming at least 2 servings of fruit (25%) or vegetables (20%), and limiting sweetened juice (30%). There was no significant difference in overall dietary adherence by child age (see section 3.3), but preschool-aged children (2-5 years) were more likely than children 6 years or older to adhere to recommendations for soda (50% vs. 30%, $P < 0.01$), juice drinks (59% vs 38%, $P < 0.01$), and fruit consumption (57% vs. 39%, $P < 0.05$).

3.2 Frequency of parents offering snacks

Table 6 shows differences in mean times per week parents offered snacks for different reasons (mean/week; standard deviation (SD)) across child characteristics (**Table 6a**) and parent/family characteristics (**Table 6b**). Overall, parents offered snacks for nutritive reasons more frequently in a given week than for non-nutritive reasons. Parents reported giving snacks to children to help them grow (2.5, SD 2.2) or to satisfy hunger (2.4, SD 2.1) almost twice as often as they did to keep a child quiet (0.7, SD 1.5) or celebrate an event or holiday

Table 6. Differences in mean times per week parent offered child snacks by demographic characteristics (n=271)

	Table 6a. Child characteristics									
	Child age		Child BMI ^a		Child sex		Child race/ethnicity			
	2-5 years (n=120)	6-12 years (n=151)	Normal (n=152)	Overweight or obese (n=117)	Male (n=120)	Female (n=151)	Hispanic/ Latino (n=154)	Black/AA (n=32)	White (n=40)	Mixed race (n=24)
Times per week parent offered snacks	Total (n=271)		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Nutritive reasons										
To help child grow	2.5 (2.2)	3.0 (2.1)	2.7 (2.2)	2.2 (2.2)	2.8 (2.2)	2.3 (2.2)	2.4 (2.2)	2.1 (2.2)^b	2.9 (2.3)	3.3 (2.0)
Because child is hungry	2.4 (2.1)	2.3 (2.2)	2.5 (2.2)	2.2 (2.1)	2.5 (2.2)	2.3 (2.1)	2.3 (2.2)^c	1.5 (1.8)	3.5 (1.9)^d	2.2 (2.0)
Non-nutritive reasons										
Reward for good behavior	1.5 (1.8)	1.9 (1.9)	1.5 (1.8)	1.4 (1.8)	1.6 (1.8)	1.4 (1.8)	1.5 (1.8)	1.0 (1.6)	1.3 (1.9)	1.3 (1.7)
To keep child quiet	0.7 (1.5)	1.0 (1.7)	0.7 (1.4)	0.8 (1.5)	0.7 (1.5)	0.8 (1.4)	0.8 (1.5)	0.5 (1.3)	0.3 (1.4)	0.6 (1.2)
Celebrate event or holiday	0.8 (1.1)	0.9 (1.1)	1.0 (1.3)	0.7 (0.9)	0.9 (1.2)	0.8 (1.0)	0.9 (1.2)^e	0.6 (0.9)	0.5 (0.3)	0.6 (0.4)
Celebrate child's achievements	1.3 (1.7)	1.7 (1.9)	1.6 (1.8)	1.0 (1.4)**	1.5 (1.8)	1.2 (1.6)	1.4 (1.7)^e	1.3 (1.5)	0.8 (1.2)	0.9 (1.4)

BMI: Body mass index, AA: African American

* $P < 0.05$ ** $P < 0.01$ *** $P < 0.001$, Statistically significant difference in means across characteristic

^a Based on Centers for Disease Control and Prevention BMI-for-age growth percentile. Overweight/obese: ≥ 85 th percentile, Normal: ≤ 5 th and < 85 th percentile)

^b Significant difference compared with mixed race parents ($P < 0.05$)

^c Significant difference compared with black/African American ($P < 0.05$)

^d Significant difference compared with Hispanic/Latino ($P < 0.001$), Black/African American ($P < 0.001$), and mixed race ($P < 0.05$)

^e Significant difference compared with white ($P < 0.05$)

Table 6b. Parent and family characteristics

	Parent Education		Parent BMI		Family food insecurity ^a	
	High school graduate or less (n=177)	College or technical school (n=94)	Normal (n=71)	Overweight (n=77)	Ycs (n=146)	No (n=125)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Times per week parent offered snacks						
Nutritive reasons						
To help child grow	2.5 (2.2)	2.3 (2.2)	2.9 (2.2)^b	2.5 (2.1)	2.3 (2.2)	2.7 (2.2)
Because child is hungry	2.4 (2.1)	2.2 (2.1)	2.5 (2.1)	2.4 (2.2)	2.4 (2.2)	2.4 (2.1)
Non-nutritive reasons						
Reward for good behavior	1.5 (1.8)	1.7 (1.9)	1.7 (1.9)	1.5 (1.8)	1.5 (1.8)	1.4 (1.8)
To keep child quiet	0.7 (1.5)	0.8 (1.5)	0.9 (1.7)	0.7 (1.4)	0.8 (1.6)	0.7 (1.4)
Celebrate event or holiday	0.8 (1.1)	0.9 (1.2)	0.9 (1.2)	0.8 (1.0)	0.9 (1.2)	0.8 (1.0)
Celebrate child's achievements	1.3 (1.7)	1.5 (1.7)	1.7 (1.9)^b	1.4 (1.8)	1.4 (1.7)	1.3 (1.7)

BMI: Body mass index

* $P < 0.05$ ** $P < 0.01$ *** $P < 0.001$, Statistically significant difference in means across characteristic

^a Using items from the United States Household Food Security Survey Module

^b Significant difference compared with obese parents ($P < 0.05$)

(0.8, SD 1.1). The most common non-nutritive reasons that parents gave children snacks were to reward good behavior (1.5, SD 1.8) and to celebrate a child’s achievements (1.3, SD 1.7).

There were significant differences in the frequency with which parents provided snacks to children based on the age of the child (**Figure 2**). Notably, although parents of children aged 2-5 years offered more snacks to help their child grow when compared to parents of elementary-aged children aged 6-12 years (3.0 vs. 2.1, $P<0.001$), they also reported offering snacks for non-nutritive purposes almost twice as often to reward good behavior (1.9 vs. 1.1, $P<0.001$), keep a child quiet (1.0 vs. 0.5, $P<0.001$), and to celebrate a child’s achievements (1.7 vs. 1.0, $P<0.001$). No significant differences were observed by child age for frequency of snacks offered because a child was hungry or to celebrate an event or holiday.

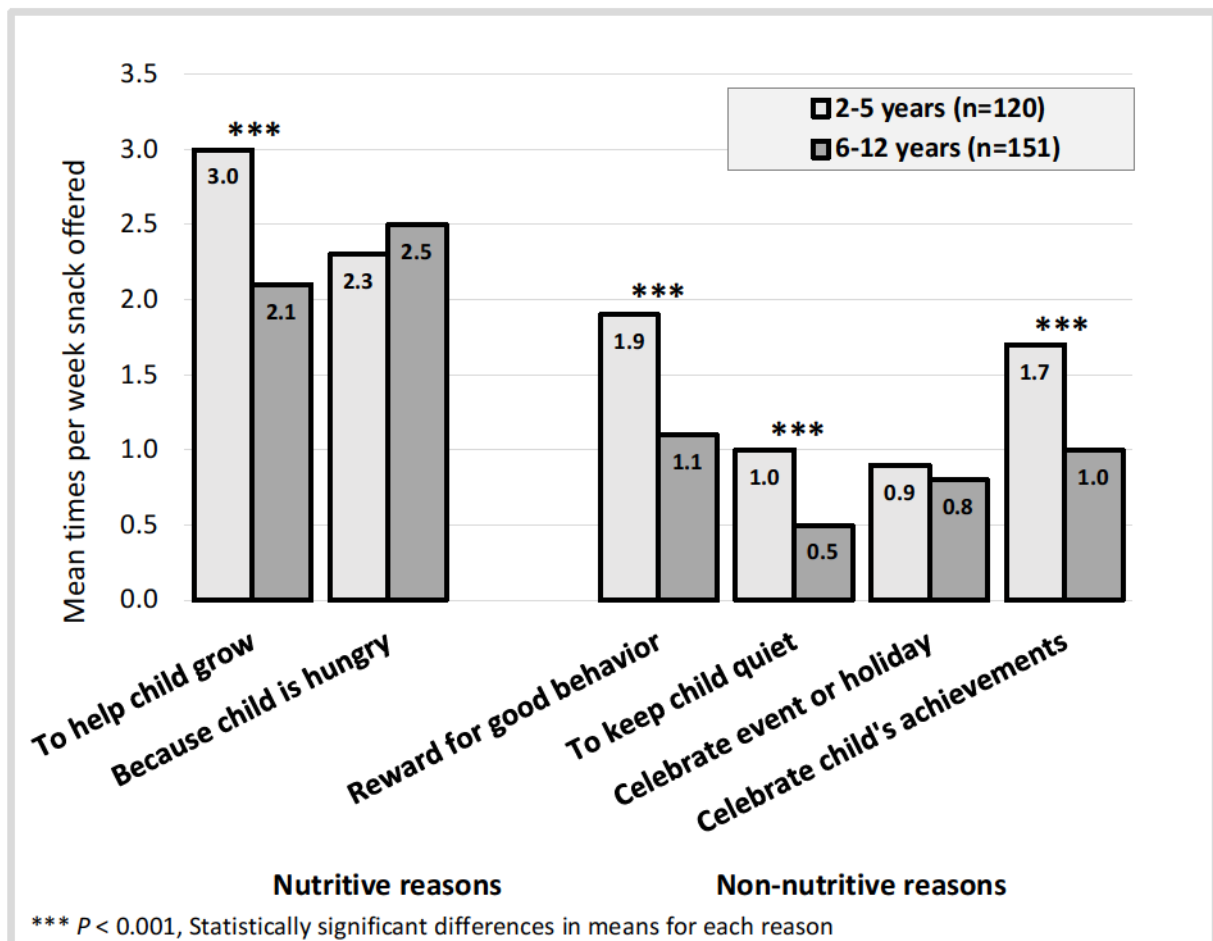


Figure 2. Differences in mean number of snacks offered per week by child age

Parents reported offering fewer snacks to overweight or obese children across both nutritive and non-nutritive reasons, though the difference was only statistically significant for snacks provided to celebrate a child's achievements (1.0 vs. 1.6, $P<0.01$). A few differences in snack feeding emerged across child race/ethnicity. Mixed race children were offered snacks significantly more often to help them grow than black children (3.3 vs. 2.2, $P<0.05$). White children (3.5, SD 1.9) received significantly more snacks because they were hungry when compared with Hispanic/Latino (2.3, SD 2.2, $P<0.001$), black children (1.5, SD 1.8, $P<0.001$) and mixed race children (2.2, SD 2.0, $P<0.05$). Across all racial/ethnic groups, black children received the least number of snacks for nutritive purposes. Hispanic children received snacks more frequently for non-nutritive purposes than children of other racial backgrounds, especially for reasons related to celebration. White children received the fewest number of snacks for non-nutritive reasons.

When compared with college-educated parents, those with a high school diploma or less were more likely to give snacks for non-nutritive reasons and less likely for nutritive reasons; this difference was significant for snacks offered to reward good behavior (1.7 vs. 1.0, $P<0.05$). Overall, obese parents reported offering their children fewer snacks for both nutritive and non-nutritive purposes when compared to normal weight parents, offering significantly fewer snacks to help children grow (2.2 vs. 2.9, $P<0.05$) and to celebrate a child's achievements (1.1 vs. 1.7, $P<0.05$). Family food insecurity was not significantly associated with any differences in snack frequency.

3.3 Snack offerings and child adherence to dietary recommendations

We compared the frequency with which parents offered snacks for different reasons with the likelihood that their child adhered to current dietary recommendations related to obesity prevention (**Table 7**).

Table 7. Association between reasons low-income parents offer snacks to children and child adherence to dietary recommendations in previous month (n=271)

	Adherence to dietary recommendations in previous month (n=81) ^a
Times per week parent offered snack to child ^b	OR (95% CI) ^c
Nutritive reasons	
To help child grow	1.05 (0.92, 1.19)
Because child is hungry	0.88 (0.77, 1.01)
Non-nutritive reasons	
Reward for good behavior	0.83 (0.70, 0.99)*
To keep child quiet	0.89 (0.73, 1.08)
Celebrate event or holiday	0.72 (0.52, 0.99)*
Celebrate child's achievements	0.82 (0.68,0.98)*

* $P < 0.05$, Statistically significant odds ratios
^a Met at least 4 of 6 recommendations for recent dietary intake: Over past month 1) consumed soda < 1 time per week, 2) consumed sweetened juice drinks < 1 time per week (punch, Kool-Aid®, Tampico, sports drinks), 3) limited 100% juice to ≤ 1 daily serving, 4) consumed fast food < 1 time per week 5) consumed 2+ servings/day of fresh, frozen or canned fruit, 6) consumed 2+ servings/day of cooked/uncooked vegetables, excluding potatoes
^b Measured in times per week parent offers child snacks
^c Odds ratio adjusted for child race, child age, child sex, child BMI z-score, parent BMI, missing parent BMI, and parent education using logistic regression

Overall, parents who offered snacks more frequently per week for non-nutritive reasons reported child dietary intake patterns that reflected lower adherence to dietary recommendations. Children whose parents offered non-nutritive snacks more frequently per week to reward good behavior (OR 0.83; CI 0.70-0.99), celebrate an event or holiday (OR 0.72; CI 0.52-0.99), or celebrate a child’s achievements (OR 0.82; CI 0.68-0.98) were significantly less likely to adhere to recommendations ($P < 0.05$). There were no significant associations between nutritive snack feeding reasons like helping a child grow (OR 1.05; CI 0.92-1.19), or addressing child hunger (OR 0.88; CI 0.77-1.01) and adherence to dietary recommendations.

4. Discussion

This is the first study of its kind to describe low-income parents’ frequency and rationales for offering their children snacks, as well as the association between parent reasons for providing snacks and child adherence to dietary recommendations. We found that parents

offered their children snacks for a variety of both nutritive and non-nutritive reasons that differed by child age, weight status, and race/ethnicity. The reasons parents offer snacks may influence the likelihood of children adhering to dietary recommendations. Children of parents offering non-nutritive snacks more frequently were less likely to adhere to current dietary recommendations related to obesity prevention than parents who didn't offer snacks for these reasons.

One encouraging finding of our study is that low-income parents reported offering snacks for nutritive reasons (e.g. because child is hungry) more frequently in a usual week than non-nutritive reasons. A recent qualitative study of low-income white, Hispanic, and African American parents found that parents who described their preschooler's hunger as an important reason for offering snack foods also described offering more healthy foods to their children [26]. We also found that a majority of parents reported that their children's diet met recommendations for consumption of fast food, soda, and juice in the previous month (e.g. limited consumption to less than once per day or week). Parent education should build upon these practices by emphasizing the benefits of low-cost, healthy, nutrient-dense snacks like fruits, vegetables, whole grains, and lean proteins.

We found that parents offered snacks to preschool-aged children (2-5 years) at a significantly greater frequency than older children (6-12 years). In some respects, these findings are expected and even appropriate. To prevent obesity, the American Academy of Pediatrics recommends structured "healthy and nutritious" snacking, as opposed to ongoing grazing, suggesting that elementary-aged children have 1-2 snacks daily and toddlers up to 3 snacks [6]. Therefore, younger children may be more likely to consume a greater number of snacks in a given week simply due to dietary needs. However, parents reported offering numerous snacks to young children for non-nutritive reasons (e.g. to reward behavior, keep child quiet, celebrate an accomplishment). Occasional rewards or celebrations may not be

cause for concern, but cumulative opportunities to snack in a given week (e.g. reward for potty training, distraction to sit quietly through church, birthday party, holiday celebration) may cue young children to eat regardless of hunger. Exposure to healthy foods in early childhood is critical because children's taste preferences may be established prior to entering elementary school [27] and using unhealthy foods to reward behavior has been shown to increase children's preferences for such foods [28]. Parents of older children may also benefit from reminders about the importance of focusing on their children's growth and hunger as a primary purpose in offering snacks, especially in light of the fact that consumption of sugary drinks nearly doubles once children reach elementary school [29].

Black children received fewer snacks for nutritive purposes and Hispanic/Latino children received a greater number of snacks for non-nutritive purposes when compared with white children. Our findings are consistent with other literature that has examined feeding intentions among low-income mothers of color. In one small qualitative study of low-income African American mothers of preschoolers, a participant explained that, "Snacks are not food," describing the general consensus that snacks were important tools to manage a child's behavior and did not require as much consideration for nutrient content compared with meals [30]. In addition to black parents, our sample represented a substantial proportion of Hispanic/Latino parents who were born outside of the United States (44%). A study of immigrant Latina mothers found that many reported offering more foods and snacks to their children upon arriving to the United States, especially fast food [31]. Findings from another study of low-income parents of preschoolers, 20% of whom were Hispanic/Latino immigrants, found that fast food items, even entire meals (e.g. Happy Meal® including burger, fries, and drink) were categorized by some participants as "snacks" rather than meals. Half of the participants agreed that pizza was not a meal food.[32] Consequently, when the frequency of snacking is assessed it is important to also consider the content of these snacks.

We found that increases in snacking opportunities, specifically snacks offered for non-nutritive purposes, may reduce adherence to dietary recommendations which reduce the risk of childhood obesity, including limiting consumption of caloric beverages (e.g. soda, juice drinks, juice) and fast food, and consuming fruits and non-starchy vegetables. Perhaps parents who offer children snacks for non-nutritive reasons are more likely to use appealing foods that have more currency with respect to behavior modification (e.g. cake versus fruit), or that increased eating opportunities are paired with caloric beverages. To combat the rising rates of childhood obesity, parents of children of all ages should be encouraged to consider snack times as important opportunities to nourish children and limit “empty” calorie foods which are nutrient poor. Snacks with higher glycemic loads, such as sugary drinks, potato chips or candy, may contribute to increased cravings for more food and reduced satiety, with a possible consequence of overeating at future eating occasions.[33-35] A study of 115 elementary-school girls found that when snacks were offered in an unrestricted setting, girls offered lower glycemic snacks of cheese and vegetables consumed 72% fewer calories than girls offered potato chips [36]. Food insecure families may also be more likely to allow children unrestricted access to such snack foods when they are available, thus contributing to the observation of the “food insecurity-obesity paradox” [26,37,38].

Our study has limitations. Parents were asked about frequency of offering snacks to their children using items developed for this study, as a validated assessment tool was not available at the time. Desirability bias is also a possibility, as parents may be reluctant to quantify the frequency with which they provide snacks for socially undesirable reasons (e.g. to keep a child quiet), although the absolute frequency of snacks reported in our study appears to reflect national estimates for child snacking.[3] Future work should include the use of validated measures to assess parents’ snack feeding behaviors, including the specific quantity, quality, and context in which child snacking is occurring. Without knowing which

foods were given based on nutritive or non-nutritive purposes, forthcoming studies should also explore these associations in the context of child adherence to dietary recommendations. Since this was a cross-sectional analysis, reverse causation may exist with respect to child or parent weight status, as parents may already be restricting a child's snack intake or adjusting their own behaviors in response to a perceived weight problem. Therefore, trends towards less reported snacks offered to overweight or obese children may not actually reflect the anticipated positive association, a phenomenon that has been described elsewhere in child snacking literature [8]. Additionally, race/ethnicity was only collected for the child of interest, rather than the parent, so we are unable to identify differences in feeding practices by parent race/ethnicity.

Nevertheless, this study is the first of its kind to describe multi-ethnic low-income parents' motivations for offering snacks to their children. Parent reasons for feeding children snacks may influence both the frequency of eating opportunities as well as the quality of a child's diet. Future investigations should assess the longitudinal influence of parent snack feeding rationales on changes in children's diet quality, food preferences, and body mass index. Early childhood obesity prevention efforts must consider the role of parents in promoting child snacking and provide capacity building around parenting strategies that utilize non-food rewards. Comprehensive approaches to obesity prevention should also address parents' snack feeding strategies while working to improve environmental barriers to offering healthy snacks such as food security, access, and availability.

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APPENDIX A

Questionnaire Items Used for Paper #3

Appendix A – Questionnaire Items Used for Paper #3

Questionnaire items used to assess child snacking	Response options and coding
<p>How often do you give your child snacks to help him or her grow?</p> <p>How often do you give your child snacks because he or she is hungry?</p> <p>How often do you give your child snacks as a reward for good behavior?</p> <p>How often do you give your child snacks to keep him or her quiet?</p> <p>How often do you give your child snacks to celebrate an event or holiday?</p> <p>How often do you give your child snacks to celebrate your child's achievements?</p>	<p>0 = Never</p> <p>0.5 = Less than once per week</p> <p>1 = Once per week</p> <p>2 = Twice per week</p> <p>3 = Three times per week</p> <p>4 = Four times per week</p> <p>5 = Five or more times per week</p>
Questionnaire items used to assess child diet quality	Response options and coding
<p>In the past month, on average, how often did your child drink any regular (not diet) sodas or soft drinks, including Malta or Penafiel? (0=Never, 1=< 1/week, 2=1/week, 3=2-4 times/week, 4=Nearly daily/daily, 5=2-4 times/day, 6=5+ times/day)</p> <p>In the past month, on average, how often did your child drink any punch, Kool-Aid®, Tampico, sports drinks, Goya juice or other fruit-flavored drinks, not including fruit juice?</p> <p>In the past month, on average, how often did your child drink fruit juice? Fruit juice is a drink, which is 100% juice, like orange juice, apple juice, or grape juice. Do not count punch, Kool-Aid®, Tampico, sports drinks, Goya juice, or other fruit-flavored drinks.</p> <p>In the past month, on average, how often did your child eat any vegetables? Please include all cooked and uncooked vegetables or salads. Do not count French fries, fried potatoes, or potato chips.</p> <p>In the past month, on average, how often did your child eat fruit? Please think about all forms of fruits, including cooked or raw, fresh, frozen or canned. Do not count fruit juice.</p> <p>In the past month, on average, how often did your child eat something from a fast food restaurant such as McDonald's, Burger King, Taco Bell, Dunkin Donuts or a pizza place? Would you say ... (0=Never, 1=< 1/week, 2=1/week, 3=2-4 times/week, 4=Nearly daily/daily, 5=2-4 times/day, 6=5+ times/day)</p>	<p>0=Never</p> <p>1=< 1/week</p> <p>2=1/week,</p> <p>3=2-4 times/week,</p> <p>4=Nearly daily/daily,</p> <p>5=2-4 times/day,</p> <p>6=5+ times/day)</p>