Head Start Parents With or Without Food Insecurity and With Lower Food Resource Management Skills Use Less Positive Feeding Practices in Preschool-Age Children

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ABSTRACT

Background: Food resource management (FRM), strategies to stretch limited food resource dollars, may mitigate the impact of household food insecurity (HFI) on family members, including young children. However, little is known about how FRM and HFI are associated with child feeding practices.

Objectives: The study aimed to explore relationships between HFI, FRM, and child feeding practices of low-income parents.

Methods: In a cross-sectional sample of 304 Head Start households, caregivers completed the USDA HFI module [classifying them as either food secure (FS) or food insecure (FI)], FRM behavior subscale (classifying them as being high or low in management skills based on a median score split), Comprehensive Feeding Practices Questionnaire, and Perceived Stress Scale. Households were categorized into 4 HFI-FRM subgroups: FS/high FRM (30.6%), FS/low FRM (31.3%), FI/high FRM (18.8%), and FI/low FRM (19.4%). Multivariable linear regression was used to examine whether feeding practices differed across HFI-FRM categories and whether the addition of parental perceived stress contributed to differences in feeding practices by HFI-FRM group.

Results: In our study, 38% of households were FI. Compared to the FS/high FRM group in the adjusted models, the FS/low FRM group used less monitoring (−0.53; 95% CI: −0.78 to −0.28), modeling (−0.38; 95% CI: −0.64 to −0.13), and involvement (−0.57; 95% CI: −0.82 to −0.32) in feeding. A similar pattern emerged for the FI/low FRM group. The use of food as a reward was higher in the FI/high FRM (0.35; 95% CI: 0.02–0.67) and FI/low FRM groups (0.33; 95% CI: 0.01–0.66) compared to the FS/high FRM group. Perceived stress was positively associated with the use of negative, controlling feeding practices, and contributed to differences in using food as a reward within the HFI-FRM group.

Conclusions: Suboptimal child feeding is evident in low-income caregivers with low FRM skills, with or without food insecurity. Promoting high FRM skills, in addition to addressing food insecurity, could potentially synergistically improve child feeding practices in low-income households. *J Nutr* 2021;151:1294–1301.

Keywords: food insecurity, food resource management, child feeding practices, head start, childhood obesity

Introduction

Childhood obesity affects about 1 in 5 children in the United States (1) and disproportionately affects disadvantaged, low-income households (2, 3). It is well evidenced that parents of preschoolers play an influential role in determining what foods come into the home and what, when, and how foods are served to children, which is critical in shaping children's food acceptance (4), energy intake (5), and weight status (6). However, little research has examined how food insecurity influences food-parenting practices of preschool-aged children.

Food insecurity is defined as the limited access to adequate food for active, healthy living due to a lack of money and other resources (7). Under food hardship at a household level, less intake of healthy foods and poorer dietary quality have been observed more consistently in adults (8, 9) than in children (8, 10). However, children in food-insecure households may experience food shortages differently; in some households, parents may shield or protect their children from experiencing food shortages (8). Further, there is limited evidence examining the impact of food insecurity on parent feeding practices. Studies have consistently shown that food-insecure infants tend

to be exposed to more controlling and less positive feeding practices (11–13). Among preschool- and school-aged children, 3 studies conducted in African-American or Mexican-American populations (14–16) and 1 in a predominantly Mexican/Latino population (17) examined the link between food insecurity and parent feeding, reporting mixed results. More research is needed to discern how food hardship due to limited resources influences feeding practices in low-income young children, who are at higher risk of being food insecure and having obesity (7).

Besides financial constraints, low-income families with young children may confront additional barriers, including limited physical access to healthy and affordable food (food deserts) (18) and conflicting demands between child care, household chores, and other activities (19). These barriers may make food shopping, preparation, and feeding more challenging. Strategies for handling foods and limited resources that maximize the nutrition/health return, referred to as food resource management (FRM) skills, could be critical for food-insecure caregivers to cope with a disadvantaged food environment and mitigate its adverse impact on family members. FRM strategies include several skills and behaviors, including meal planning, shopping strategies, food selection, budgeting, food preparation, and cooking strategies (20). Observational (21) and trial data (22, 23) have shown a link between FRM skills and better diet quality in low-income adults. However, little is known about how young children are fed based on their household food security status and caregivers' FRM behaviors in low-income households.

The primary objective of this study was to examine how food insecurity and FRM skills are related to feeding practices in a sample of caregiver-preschooler dyads enrolled in Head Start classrooms in Central Pennsylvania. Because food insecurity is a significant stressor (24) and caregivers' stress is associated with suboptimal feeding in low-income households (25–28), our secondary objective was to investigate whether the caregiver's psychosocial stress accounts for some of the observed differences in feeding practices by household food security status and FRM skills. We hypothesized that 1) food-insecure caregivers of preschoolers who have lower FRM skills would report the least optimal feeding practices; and 2) increased parental stress would weaken this relationship.

Methods

Study design and participants

Children involved in this study were enrolled in Head Start preschool classrooms in 4 rural counties in central Pennsylvania. Caregivers and children were recruited through a needs assessment survey that was distributed by the Head Start teachers, with data collection occurring from May 2017 to May 2018. Out of the 1279 distributed surveys,

379 surveys (29.6%) were returned with implied consent and completed survey forms. The majority of caregiver respondents were parents (90%); therefore, we refer to caregivers as “parents” throughout the article. We excluded 4 children who were older than the Head Start preschool age eligibility, 9 parents who had more than 1 Head Start-eligible child, and 62 parent-child dyads with missing data for household food insecurity ($n = 1$), food resource management ($n = 1$), feeding practices ($n = 1$), parental BMI ($n = 16$), and other covariates ($n = 43$), resulting in a final analytic sample of 304 (80.2% of the returned surveys) parent-child dyads.

Feeding practices

The 49-item Comprehensive Feeding Practices Questionnaire (CFPQ) was used to measure caregiver feeding practices (29). The instrument has been validated (29) and successfully used in low-income populations (30). The CFPQ was developed using a theory-based systematic approach (31), and consists of 12 subscales that measure a wide range of feeding practices. Seven subscales with acceptable internal consistency in our sample (Cronbach's alphas ≥ 0.70) were considered as our primary outcomes, including 3 subscales measuring positive feeding practices (monitoring, modeling, involvement) and 4 subscales measuring negative feeding practices (emotion regulation, food as reward, restriction for weight control, restriction for health). For positive feeding practices, the monitoring subscale measured the extent to which parents kept track of their child's intake of less healthy foods ($n = 4$ items). The modeling subscale assessed the extent to which parents actively demonstrated healthy eating for their child ($n = 4$ items). The involvement subscale measured the extent to which parents encouraged their child's involvement in meal planning and preparation ($n = 3$ items). For negative feeding practices, the “emotion regulation” subscale captured the extent to which parents used food to regulate their child's emotional states ($n = 3$ items), the “food as reward” subscale measured the extent to which parents used food as a reward for their child's behavior ($n = 3$ items), the “restriction for weight control” subscale assessed the extent to which parents controlled their child's food intake with the purpose of decreasing or maintaining the child's weight ($n = 8$ items), and the “restriction for health” subscale captured the extent to which parents controlled their child's food intake with the purpose of limiting less healthy foods and sweets ($n = 4$ items). Parents were asked to respond on a 5-point Likert scale for each item, with ranges from 0 (never) to 5 (always). Reverse coding was applied where applicable to make all items consistent, such that higher scores indicate greater frequency of that feeding practice. The total subscale score was calculated and then averaged by the number of items in the subscale. Prior literature exploring different feeding practices and child nutrition and health outcomes (32, 33) suggest that greater use of positive feeding practices is more protective, while greater use of negative feeding practices is associated with undesirable child outcomes.

Household food insecurity

The 18-item USDA Household Food Security Module was applied to assess household food insecurity (HFI) in the prior 12 months (7). Per categorization guidance, households with <3 affirmative responses were categorized as food secure (FS) and those with ≥ 3 affirmative answers were categorized as food insecure (FI).

FRM skills

The 6-item, 5-point Likert Food Resource Management Behavior Subscale was used to assess the frequency of several strategies applied by parents that may help stretch their food resource dollars. These questions were taken from the Supplemental Nutrition Assistance Program's (SNAP's) SNAP-Ed toolkit, including “compare prices before buying,” “plan meals before shopping for groceries,” “prepare shopping list when grocery shopping,” “check food on hand before making a shopping list,” “use grocery store flyers to plan meals,” and “identify foods on sale or use coupons” (34). The Cronbach's alpha of the subscale in our sample was 0.78. The total FRM score was calculated first, then averaged with higher scores, which indicate better FRM skills. Parents then were categorized as having low or high FRM skills, based

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Supplemental Tables 1 and 2 are available from the “Supplementary data” link in the online posting of the article and from the same link in the online table of contents at <https://academic.oup.com/jn/>.

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Abbreviations used: CFPQ, Comprehensive Feeding Practices Questionnaire; FI, food insecure; FRM, food resource management; FS, food secure; HFI, household food insecurity; PSS-10, 10-item Perceived Stress Scale; SNAP, Supplemental Nutrition Assistance Program; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

on whether their mean FRM score fell below or above the median (median score = 3.67).

Parental perceived stress

The 10-item Perceived Stress Scale (PSS-10) was used to assess parental perceived stress (35). The PSS-10 is a widely used, well-validated scale (36) that measures the degree to which respondents believe their life to be unpredictable, uncontrollable, and overwhelming. Parents were asked to rate their feelings, thoughts, and stress levels in the past month on a 5-point Likert scale. The total score was calculated by first summing the 10 items and then standardizing the sums as z-scores (mean = 0; SD = 1), with higher scores indicating higher levels of stress. In our sample, the internal consistency of the PSS-10 was good, with a Cronbach's alpha of 0.85.

Covariates

We collected parental and household characteristics for consideration as covariates in our analysis. For parental characteristics, we included age, race/ethnicity (non-Hispanic white or other), sex, education ($\leq$ high school, $>$ high school), marital status (married/partnered, single/divorced/separated/widowed), employment status (yes/no), self-reported height and weight, BMI (kg/m^2), and weight status (underweight if BMI <18.5 , normal weight if BMI ≥ 18.5 and <25 , overweight if BMI ≥ 25 and <30 , obese if BMI ≥ 30). For household characteristics, we included number of children; number of people in household supported by income; yearly household income ($<\$20,000$, $\geq \$20,000$); SNAP participation status in the past 12 months; Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) participation status in the past 12 months; Temporary Assistance for Needy Families participation status in the past 12 months; and county (Bradford-Tioga, Blair, Huntingdon, Snyder-Union-Mifflin). Imputation for missing income was performed using the PROC MI command in SAS software (SAS Institute Inc.) based on WIC and SNAP statuses, parent education, marital status, and employment.

Statistical analysis

Given the independent relationship between HFI and FRM behavior (37) (chi-square test, $P = 0.76$), parent-child dyads were categorized into 4 subgroups: FS/high FRM, FS/low FRM, FI/high FRM, and FI/low FRM. The FS/high FRM group was considered the most optimal combination, the FI/low FRM group was considered the least optimal combination, and the FS/low FRM and FI/high FRM groups were considered to fall in between the 2 extreme groups. The distributions of parental characteristics, household characteristics, parental perceived stress scores, and feeding practices scores were compared between the 4 subgroups using a chi-square test for categorical variables. Normality was tested in continuous variables using the skewness and kurtosis test; all but 1 variable, parent height ($P = 0.09$), yielded a joint probability less than 0.05. Therefore, continuous variables were treated as ordered but non-normal variables, and a Kruskal-Wallis test was applied to compare their distribution by subgroups. The nonparametric trend tests were used to examine trends across ordered HFI-FRM subgroups.

The feeding practices were first compared between the FS and FI groups using the Kruskal-Wallis test. To quantify the differences in feeding practice scores by HFI-FRM subgroups, a univariable linear model was constructed using FS/high FRM as the referent group (Model 1). Covariates that were found to be statistically significant among the subgroups in terms of distribution or a P -trend < 0.1 were included in a multivariable model to assess the adjusted differences in feeding practice scores (Model 2). Household income was also controlled for in Model 2 to adjust for unmeasured confounding factors related to poverty, FI, FRM, and feeding practices. A third model (Model 3) additionally adjusted for perceived stress. A sensitivity analysis was conducted to test the validity of findings by adjusting for significant and nonsignificant covariates as potential confounders in Model 2 and Model 3. We also compared the characteristics and feeding practices between the included and excluded subjects to examine potential sources of bias associated with missing data.

Results

Sample characteristics

There were 116 (38.2%) FI households in our study population. In the FS/high FRM (the most optimal combination), FS/low FRM, FI/high FRM, and FI/low FRM (the least optimal combination) groups, there were 93 (30.6%), 95 (31.3%), 57 (18.8%), and 59 (19.4%) parent-child dyads, respectively. Table 1 presents the sample characteristics by HFI-FRM subgroup. In the analytic sample, most parents were non-Hispanic white (93.8%) and female (95.4%), with a mean age of 32.2 years (SD, 9.3 years). More than half of the parents were married (62.8%) and had educational attainment less than or equal to a high school education (58.9%). About half of the parents were employed (49.0%), had obesity (46.1%), and were living in households with an annual income less than \$20,000 (47.0%). None of the examined parental and household characteristics differed by HFI-FRM subgroup, with the exception of SNAP participation ($P = 0.003$), and there was a significant, increasing trend of SNAP participation from the FS/high FRM (the most optimal combination) to the FI/low FRM group (the least optimal combination; P -trend = 0.001). WIC participation was higher in the 2 FS groups (FS/high FRM, 78.5%; FS/low FRM, 70.5%) than the 2 FI groups (FI/high FRM, 63.2%; FI/low FRM, 66.1%). Although the difference in proportions was not statistically significant ($P = 0.179$), there was a decreasing trend of WIC participation across the ordered HFI-FRM subgroups, from FS/high FRM to FI/low FRM (P -trend = 0.051).

Table 2 shows the feeding practice scores and parental perceived stress scores by food security status and by HFI-FRM group. Most of the feeding practices did not differ by household food security status (P values ranged from 0.244–0.956), yet parents from food-insecure households tended to have higher scores on the “food as reward” subscale as compared to parents from food-secure households ($P = 0.071$). On average, parental perceived stress scores were about 4 points or 0.7 SDs higher in the food-insecure parents when compared to the food-secure parents (both P values < 0.001). The distribution of all 3 positive feeding practice scores for the monitoring, modeling, and involvement subscales differed significantly by HFI-FRM groups (all P values < 0.005). There was a decreasing trend in scores for monitoring (P -trend = 0.028) and a marginally significant decreasing trend for modeling (P -trend = 0.07) across the ordered HFI-FRM subgroups, such that these positive feeding practices were utilized the most in the FS/high FRM group and the least in the FI/low FRM group. For negative feeding practices, scores on the “restriction for weight control” subscale were higher in the FI/high FRM group compared to the other groups ($P = 0.043$), but a significant trend was not detected across the HFI-FRM groups (P -trend = 0.971). Compared to the other groups, the mean score on the “food as reward” subscale tended to be lower in the FS/high FRM group ($P = 0.095$), and there was a significant increasing trend in the score from the FS/high FRM group to the FI/low FRM group (P -trend = 0.020). Distributions for the “emotion regulation” subscale ($P = 0.884$; P -trend = 0.748) and “restriction for health” subscale ($P = 0.446$; P -trend = 0.334) did not differ by HFI-FRM subgroups. The difference in parental stress scores was 5.2 points or 0.9 SDs between parents in the FS/high FRM group and parents in the FI/low FRM group, and a significant trend for higher stress levels was observed across the 4 HFI-FRM subgroups (P -trend < 0.001).

TABLE 1 Parental and household characteristics in Head Start families by food insecurity and food resource management skill level

	Total	Food secure		Food insecure		<i>P</i> value ¹	<i>P</i> -trend ²
		High FRM behavior	Low FRM behavior	High FRM behavior	Low FRM behavior		
Families, <i>n</i> (%)	304	93 (30.6%)	95 (31.3%)	57 (18.8%)	59 (19.4%)		
Parental characteristics							
Parent age, y	32.2 (9.3)	33.2 (11.1)	31.2 (8.4)	32.7 (8.6)	31.7 (8.2)	0.450	0.961
Parent ethnicity, %	—	—	—	—	—	0.274	0.089
Non-Hispanic white	93.8	96.8	94.7	89.5	91.5		
Other	6.3	3.2	5.3	10.5	8.5		
Female, %	95.4	96.8	94.7	94.7	94.9	0.900	0.579
Highest parent education completed, %	—	—	—	—	—	0.478	0.855
≤High school	58.9	55.9	64.2	52.6	61.0		
>High school	41.1	44.1	35.8	47.4	39.0		
Married, %	62.8	66.7	64.2	61.4	55.9	0.590	0.175
Employed, %	49.0	46.2	56.8	42.1	47.5	0.288	0.738
Height, cm	163.5 (7.3)	162.9 (6.9)	164.1 (7.0)	163.4 (7.2)	163.4 (8.5)	0.779	0.790
Weight, kg	80.1 (22.5)	80.3 (20.5)	80.1 (22.0)	82.0 (22.7)	78.1 (26.1)	0.446	0.321
BMI, kg/m ²	30.0 (8.1)	30.2 (7.2)	29.8 (8.4)	30.7 (8.2)	29.2 (8.9)	0.425	0.275
BMI status, %						0.804	0.179
Underweight	2.0	1.1	3.2	1.8	1.7		
Normal weight	30.3	25.8	30.5	28.1	39.0		
Overweight	21.7	24.7	20.0	19.3	22.0		
Obese	46.1	48.4	46.3	50.9	37.3		
Household characteristics							
Number of children	2.5 (1.2)	2.5 (1.3)	2.5 (1.3)	2.4 (1.0)	2.5 (1.1)	0.949	0.627
Number of people supported by income	4.0 (1.7)	4.1 (1.8)	4.0 (1.7)	3.9 (1.7)	3.9 (1.5)	0.948	0.576
Yearly household income, %	—	—	—	—	—	0.659	0.436
<\$20,000	47.0	46.2	45.3	43.9	54.2		
≥\$20,000	53.0	53.8	54.7	56.1	45.8		
Participation in assistance program in the past 12 months, %							
SNAP/Food Stamps	74.7	69.9	66.3	78.9	91.5	0.003	0.001
WIC	70.7	78.5	70.5	63.2	66.1	0.179	0.051
TANF ³	9.1	7.6	9.2	8.5	11.5	0.893	0.495
County, %	—	—	—	—	—	0.605	0.520
Bradford-Tioga	26.6	29.0	23.2	35.1	20.3		
Blair	35.2	36.6	37.9	28.1	35.6		
Huntingdon	21.7	16.1	22.1	22.8	28.8		
Synder-Union-Mifflin	16.4	18.3	16.8	14.0	15.3		

Values are *n* (%) or mean (SD). FRM, food resource management; HFI, household food insecurity; SNAP, Supplemental Nutrition Assistance Program; TANF, Temporary Assistance for Needy Families; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

¹ *P* values were calculated using a chi-square test for categorical variables and a Kruskal-Wallis test for continuous variables.

² *P*-trend were calculated using the nonparametric test for trend across ordered HFI-FRM subgroups.

³ There were 39 people with missing data in TANF.

Figure 1 depicts the differences in positive feeding scores when comparing the other 3 HFI-FRM subgroups with the referent group, FS/high FRM. Similar results were observed in the unadjusted Model 1 and adjusted Model 2, where parents with low FRM skills, with or without HFI, had significantly or marginally lower scores (all *P* values < 0.05, except for the involvement subscale in FI/low FRM, with *P* = 0.058) for monitoring (β = −0.53 to −0.52 for FS/low FRM; β = −0.41 to −0.40 for FI/low FRM), modeling (β = −0.38 for FS/low FRM; β = −0.44 to −0.40 for FI/low FRM), and involvement (β = −0.57 for FS/poor; β = −0.3 to −0.28 for FI/low FRM) than those with high FRM skills. In contrast, there were no differences in any of the 3 positive feeding scores between the FI/high FRM group and the FS/high FRM referent group. With the addition of perceived stress in Model 3, the differences in positive feeding practices remained virtually unchanged from those estimated in Model 2 for the FS/low FRM group, but became slightly smaller in the FI/low FRM group for monitoring

and involvement. Perceived stress was marginally associated with scores on the involvement subscale (β = 0.10 per 1 SD increase; 95% CI: −0.21 to 0.00; *P* = 0.051) and was not associated with scores on the monitoring subscale (β = −0.03; 95% CI: −0.14 to 0.07; *P* = 0.532) or the modeling subscale (β = −0.07; 95% CI: −0.18 to 0.03; *P* = 0.174).

The model results for differences in negative feeding scores are presented in **Figure 2**. Using the FS/high FRM group as the referent, there were no significant differences in any of the 3 models in scores for “emotion regulation,” “restriction for weight control,” or “restriction for health.” Parents in the FI/high FRM group had a marginally higher mean score on the “restriction for health” subscale as compared to parents in the FS/high FRM group in the adjusted Model 2 (β = 0.33; 95% CI: −0.01 to 0.66; *P* = 0.057). In the unadjusted Model 1, scores on the “food as reward” subscale were significantly higher for the FI/high FRM group (β = 0.35; 95% CI: 0.03–0.67; *P* = 0.033) and for FI/low FRM group (β = 0.34; 95% CI: 0.02–0.65;

TABLE 2 Distribution of parental perceived stress and feeding practices in Head Start families by food insecurity and food resource management skill level

n(%)	Total 304 (100%)	FS 188 (61.8%)	FI 116 (38.2%)	P value, FS vs. FI ¹	FS		FI		P value across HFI-FRM subgroups ¹	P-trend across HFI-FRM subgroups ²	
					High FRM 92 (30.6%)	Low FRM 95 (31.3%)	High FRM 57 (18.8%)	Low FRM 59 (19.4%)			
Positive feeding practices											
Monitoring	4.0 (0.9)	4.0 (0.9)	4.0 (0.8)	0.878	4.2 (0.9)	3.7 (0.9)	4.2 (0.7)	3.8 (0.9)	<0.001	0.028	
Modeling	4.0 (0.9)	4.0 (0.9)	4.0 (0.9)	0.956	4.2 (0.8)	3.8 (0.9)	4.3 (0.7)	3.8 (1.0)	0.002	0.071	
Involvement	3.9 (0.9)	3.8 (0.9)	3.9 (0.9)	0.639	4.1 (0.8)	3.6 (1.0)	4.0 (0.9)	3.8 (0.9)	<0.001	0.197	
Negative feeding practices											
Emotion regulation	1.4 (0.6)	1.4 (0.6)	1.4 (0.6)	0.877	1.4 (0.5)	1.5 (0.6)	1.5 (0.7)	1.4 (0.4)	0.884	0.748	
Food as reward	2.1 (1.0)	2.1 (0.9)	2.3 (1.0)	0.071	1.9 (0.9)	2.2 (1.0)	2.3 (1.1)	2.3 (0.9)	0.095	0.020	
Restrict for weight	1.7 (0.6)	1.7 (0.6)	1.7 (0.6)	0.244	1.7 (0.6)	1.6 (0.5)	1.8 (0.5)	1.7 (0.6)	0.043	0.971	
Restrict for health	2.8 (1.0)	2.8 (1.0)	2.9 (1.0)	0.248	2.7 (1.0)	2.8 (1.0)	3.0 (0.9)	2.9 (1.1)	0.446	0.334	
Parental perceived stress, total score	25.9 (6.3)	24.4 (5.7)	28.5 (6.3)	<0.001	24.1 (5.6)	25.0 (5.7)	27.4 (6.1)	29.3 (6.5)	<0.001	<0.001	
Parental perceived stress, standardized score	0.0 (1.0)	−0.3 (0.9)	0.4 (1.0)	<0.001	−0.3 (0.9)	−0.2 (0.9)	0.2 (1.0)	0.6 (1.0)	<0.001	<0.001	

Values are means (SDs). FI, food insecurity; FRM, food resource management; FS, food secure; HFI, household food insecurity.

¹ P values were calculated using the Kruskal-Wallis test.

² P-trends were calculated using the nonparametric test for trend across ordered HFI-FRM subgroups.

$P = 0.036$), and marginally higher for the FS/low FRM group ($\beta = 0.26$; 95% CI: -0.02 to 0.53 ; $P = 0.071$), as compared to the referent group, FS/high FRM. The magnitude of score differences remained similar in the adjusted Model 2. Perceived stress was added to Model 3 and was associated with 3 of the 4 negative feeding practices. For each 1 SD increase in the parental perceived stress score, there were significant increases in the scores for “emotion regulation” ($\beta = 0.09$; 95% CI: 0.03 – 0.16 ; $P = 0.007$), “food as reward” ($\beta = 0.16$; 95% CI: 0.04 – 0.27 ; $P = 0.008$), and “restriction for health” ($\beta = 0.19$; 95% CI: 0.07 – 0.31 ; $P = 0.002$), as well as a marginal increase in the score for “restriction for weight control” ($\beta = 0.06$; 95% CI: 0.00 – 0.12 ; $P = 0.062$). The difference in scores on the “food as reward” subscale between the HFI-FRM groups changed to be nonsignificant ($\beta = 0.18$; 95% CI: -0.15 to 0.52 ; $P = 0.282$) with the addition of parent stress in Model 3.

Results regarding both positive and negative feeding practices stayed robust in the sensitivity analysis after additionally adjusting for child age; parental race/ethnicity, age, sex, BMI, education, marital status, and employment status; number of children; household size; and region (Supplemental Table 1). The included and excluded parents and children did not differ in their individual and household characteristics, stress scores, or any of the feeding practices being examined (Supplemental Table 2).

Discussion

In this study, in a sample of predominantly white, low-income Head Start households, we provided empirical evidence that FRM skills may influence the relationship between food insecurity and child feeding practices in preschoolers. The 3 positive and 4 negative feeding practices examined in the present study did not differ by household food security status alone. However, after considering the FRM skills, we found parents with low FRM skills, regardless of their household’s food security status, applied less positive feeding practices, including monitoring, modeling, and involvement, as compared to parents from food-secure households with high FRM skills. Interestingly, parents from food-insecure households who had high FRM skills managed to use similarly positive feeding practices compared to parents from food-secure households with high FRM skills. Negative feeding practices, such as using emotional regulation and restricting food for health reasons, did not differ by HFI-FRM status. Parents living in food-insecure households, regardless of their FRM skills, used food as a reward more often when feeding their preschoolers. Parental perceived stress was positively related to negative feeding practices, and partially explained differences in the use of food as a reward by HFI-FRM group. The novel findings from our study suggest that the FRM skills of low-income caregivers could be used as a way to mitigate the potential adverse impacts of food insecurity on parent feeding practices and child diet.

Prior research has primarily focused on how a lack of money and resources for food is related to caregivers’ feeding practices in low-income households. Compared to those in food-secure households, food-insecure caregivers were more likely to endorse using food to soothe their crying infants and less likely to pay attention to babies’ hunger or fullness cues in infants aged 2 months (11); more likely to exhibit restrictive and pressuring feeding styles in infants aged 2 weeks to 6 months (12); and less likely to apply positive parenting, which in turn adversely influenced feeding and weight status,

FIGURE 1 Unadjusted and adjusted differences in positive feeding practice scores by food insecurity and food resource management skill levels in Head Start families ($n = 304$). Values are β coefficients and 95% CIs. Model 1 was unadjusted. Model 2 was adjusted for SNAP, WIC, and household income. Model 3 was adjusted for the variables included in Model 2 and perceived stress. FI, food insecure; FS, food secure; H-FRM, high food resource management; L-FRM, low food resource management; SNAP, Supplemental Nutrition Assistance Program; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

in infants aged 9 months (13). However, it remains unclear whether differences in feeding practices associated with food hardship at the household level extend to early childhood. In children 3–5 years old, 2 studies investigated this association and found null relationships (15, 17), which could have been due to their small sample sizes (both $n < 90$). However, our study of more than 300 caregiver-child dyads likewise showed that HFI was not related to any of the 7 feeding skills that were examined. When adding caregivers' FRM skills as a second dimension for household categorization, we noticed that the feeding practices diverged between groups. Prior randomized

controlled trials of FRM education interventions supported the theory that FRM and food security could be 2 independent attributes: FRM education did not necessarily improve food security (22, 23), but seemed to enhance food security when FRM training plans were tailored (38) or when FRM education was coupled with tangible food assistance, such as participation in SNAP (39). Our results suggest that caregivers' FRM skills are important in mitigating the potential adverse impacts of food insecurity on child feeding behaviors in preschoolers.

To our knowledge, our study is the first to report consistent findings regarding FRM skills and positive feeding practices.

FIGURE 2 Unadjusted and adjusted differences in negative practices scores by food insecurity and food resource management skill levels in Head Start families ($n = 304$). Values are β coefficient and 95% CI. Model 1 was unadjusted. Model 2 was adjusted for SNAP, WIC, and household income. Model 3 was adjusted for the variables included in Model 2 and perceived stress. FI, food insecure; FS, food secure; H-FRM, high food resource management; L-FRM, low food resource management; SNAP, Supplemental Nutrition Assistance Program; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

Low FRM skills, regardless of HFI status, were related to less application of monitoring, modeling, and involvement feeding behaviors. This finding may provide a novel mechanism that can help explain the complex relationship between food insecurity and obesity in low-income children. Multiple independent reviews reported mixed findings regarding the correlation between food insecurity and obesity in children (40–42). While the variability in the associations was not fully understood, prior research provided several factors that could modify the food insecurity–obesity relationship in young children, including food assistance program participation (43) and maternal stressors (44). Caregivers’ FRM skills could be another modifier that has been overlooked. After controlling for SNAP participation, WIC participation, and parental perceived stress, only food-insecure parents with low FRM skills, but not food-insecure parents with high FRM skills, had significantly lower monitoring and modeling scores as compared to the referent group. Prospective studies have suggested that parental ability to track unhealthy foods predicted less obesogenic eating behaviors (45) and less weight gain in children (46, 47), but longitudinal findings were not always consistent (48). Modeling healthy eating by parents, on the other hand, was associated with better child eating behavior (i.e., less food fussiness and higher interest in foods) (49), greater child fruit and vegetable intake (50), and a favorable cross-sectional child BMI (50), but not a short-term change in child BMI (assessed at a 1-year follow-up) (49). A cross-sectional study in a sample of low-income preschoolers supports an adjusted relationship between better FRM skills and ~20% reduced odds of child overweight (51). Though still in need of further investigation using longitudinal data, putting our study findings and prior evidence together, parental FRM skills may be associated with child risks of obesity through alterations in feeding practices and child dietary behaviors.

With respect to the 4 negative feeding practices, only using food as a reward was applied more in food-insecure parents, and this relationship may have been partially due to increased parental perceived stress. The null difference in negative feeding practices by HFI-FRM subgroups was unexpected, yet it may be due to the low application of all 4 negative feeding practices reported in our sample. Stress has been recognized as a factor that influences feeding practices (52). Compensatory interventions to augment food security, such as participation in the SNAP and WIC programs, seem to have attenuated but not eliminated adult psychological distress (53). We observed that stress was more consistently associated with multiple negative feeding practices and with none of the positive feeding practices in our study, even after adjusting for food assistance program participation. Future studies are needed to further investigate the mechanisms linking the home food environment, parental stress, and feeding behaviors.

There are several limitations that need to be recognized in this study. The cross-sectional nature of the study could not establish a temporal relationship between food insecurity, FRM skills, stress, and feeding practices. Therefore, the empirical associations observed were not necessarily causal relationships. Self-report bias may have been introduced when reporting FRM skills and feeding practices based on parents’ perceptions of the “correct” behaviors and when reporting parental anthropometric data based on social desirability. Common methods bias may have been introduced through utilizing the same survey method to measure food insecurity, FRM skills, and feeding practices, although we did not detect common methods variance to be an issue in our sample using the

Harman’s single-factor test (54). Finally, the study findings may not be generalizable to all low-income households, due to the low response rate and potential self-selection bias. Given the predominantly non-Hispanic white sample (93.8%), our findings regarding food insecurity, FRM skills, and feeding practices may not represent other race/ethnicity groups.

In conclusion, food insecurity was prevalent in this cross-sectional sample of low-income Head Start parents with preschoolers, but child feeding practices did not differ by household food security status alone. Parents with low FRM skills, with or without food insecurity, applied less positive child feeding practices. Our empirical findings suggest a potential modifying effect of FRM skills on the relationship between food insecurity and child feeding practices. Parental stress was associated with negative feeding practices and may have contributed to differences in the “food as reward” feeding behavior. Promoting FRM skills, in addition to strategies that address household food insecurity, may be needed to improve food availability, accessibility, and utilization in low-income households with preschool-age children.

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