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Association of Picky Eating with Weight Status and Dietary Quality among Low-Income Preschoolers

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Abstract

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CONTRIBUTOR'S STATEMENT PAGE

Dr. Brown conceptualized and designed the study, drafted the initial manuscript, and approved the final manuscript as submitted.
Drs. Perrin and Contreras and Ms. Ball conceptualized and designed the study, revised the manuscript critically for important intellectual content, and approved the final manuscript as submitted.
Drs. Peterson, Brophy Herb, Horodynski, Miller, and Lumeng conceptualized and designed the study, coordinated and supervised data collection, revised the manuscript critically for important intellectual content, and approved the final manuscript as submitted.
Ms. Appugliese carried out the initial analyses, revised the manuscript critically for important intellectual content, and approved the final manuscript as submitted.

Background—Picky eating is common in children. Few studies have examined predictors of picky eating, and the association of picky eating with weight status and dietary quality is inconsistent in prior literature. We aimed to identify predictors of picky eating and to test the association of picky eating with child body mass index z-score (BMIz), dietary quality, and micronutrient intake.

Methods—This was a cross-sectional analysis of baseline data from a randomized controlled trial to prevent obesity among 506 preschoolers attending Head Start. Parents completed questionnaires to assess picky eating and child temperament. Three 24-hour dietary recalls were collected to assess dietary intake. Multivariate regression models assessed child, parent, and family predictors of picky eating; additional models tested adjusted associations of picky eating with child BMIz, dietary quality (measured by the Healthy Eating Index [HEI]), and micronutrient intake.

Results—Picky eating was predicted by male sex, older child age, and more difficult temperament but not race/ethnicity, maternal BMI, maternal depressive symptoms, household food insecurity, or single parent home. Picky eating was not associated with child BMIz or micronutrient deficiencies; it was inversely associated with total HEI score and servings of whole fruit, total vegetables, greens and beans, and total protein foods.

Conclusions—Pediatric providers should support parents in expanding the number of healthy foods the child eats to improve dietary quality, but reassure parents that picky eating is not associated with children's weight status or micronutrient deficiencies.

INTRODUCTION

Picky eating is a common parental concern that is frequently raised as an issue needing intervention with the pediatric provider.[1] Identifying child, parent, and family predictors of picky eating in young children would help the pediatric provider identify which parents are most likely to be concerned and to tailor anticipatory guidance accordingly. Understanding the links between picky eating and children's weight status and dietary quality would provide the necessary evidence base to drive anticipatory guidance.

Although various measures have been used to assess picky eating, picky eating is generally defined as eating a limited variety of foods.[2] The vast majority of previous studies have exclusively relied on parental report to determine the presence of picky eating. One study additionally tested food acceptance in a feeding laboratory by giving children yogurt with a variety of textures, colors, and tastes.[3] Another examined children's feeding behaviors during a standardized home feeding and 24-hour dietary recall, and found that parental report of picky eating was associated with a consistent pattern of inhibited and selective eating.[4]

Limited prior literature has examined predictors of picky eating. Lower household income,[5,6] younger maternal age,[7] non-white race/ethnicity,[6] and food insecurity[8] have been associated with picky eating. Studies have mixed results with regard to associations with child sex, with some studies describing picky eating as more prevalent in boys,[5,6] another finding picky eating to be more prevalent in girls,[9] and other studies finding no difference by sex.[4,10] Child traits, such as a temperament characterized by greater emotionality[7] and more negative affect[4] have also been associated with picky eating.

The literature examining associations between picky eating and weight status is notably conflicting, with some studies finding no association,[4,11,12] some finding a greater risk of overweight,[10] and some finding a greater risk of underweight.[8,13] A recent systematic review[2] found that of nine longitudinal studies examining this association, seven studies found no association,[1,4,11,14–17] one study found no association at 9 years if BMI was below the median at 5 years and a negative association at 9 years if BMI was above the median at 5 years,[9] and one study showed greater odds of underweight.[8] The literature examining associations between picky eating and dietary quality is equally conflicting, with studies reporting greater intake of junk food[5] and greater overall energy intake,[10] while other studies have reported lower overall energy intake,[4,6] including lower intake of fruits and vegetables[4,5,18] and vitamins and minerals.[6,18]

Interpretation of prior work is limited by a number of factors. Many studies have examined non-US samples,[5,6,10] and the US samples were often mostly white[18] and of higher socioeconomic status.[19] Consideration of picky eating within a low income population is especially important given that picky eating,[5–8] poor dietary quality,[20] and both under-[21] and overweight[22] are more common in lower-socioeconomic status, non-white U.S. populations. Although picky eating is more common in preschool-aged children,[6] much of the prior work has focused on school-age children.[12,18] Child height and weight have often been assessed by parental report, which has limited validity.[19,23] Dietary quality has often been assessed by food frequency questionnaire[5,6,10] in contrast to 24-hour dietary recall, which may provide more precise information on food preparation and amounts consumed by young children.[24] Among studies using dietary recalls, most used a single recall[19] rather than the multiple recalls[18] needed to capture intra-individual variability in consumption.

Therefore, within a cohort of low-income preschoolers, this study sought to address three objectives: 1) to test the association of child, parent, and family characteristics with picky eating; 2) to test the association of picky eating with measured child body mass index z-score (BMIz); and 3) to test the hypothesis that picky eating is associated with lower dietary quality and micronutrient intake using multiple 24-hour dietary recalls.

METHODS

Study Design

This was a cross-sectional secondary data analysis of The Growing Healthy study,[25] which is a randomized controlled obesity prevention trial among preschoolers attending Head Start. This report describes only pre-intervention data collected across study arms. The study was approved by the Institutional Review Boards of the University of Michigan and Michigan State University.

Participants

Participants were 3–4 years of age at enrollment and attended one of three Head Start programs in rural and urban areas of Michigan. Almost all families in the participating Head Start programs had annual household incomes below the federal poverty line (for example, $24,300 for a family of four in 2016). Inclusion criteria were the child being aged 3 or 4

years at study enrollment. Exclusion criteria were a significant developmental disability, the child being in foster care, or parent non-fluency in English. Families were told about the study through classroom open houses and through flyers sent home in children's backpacks. Parents completed an initial enrollment packet, including a written consent form and were then called by study personnel to review enrollment criteria, confirm understanding of the study, and to validate informed consent. Questionnaires were completed using computer-assisted interviewer administration.

Picky Eating

The Children's Eating Behavior Questionnaire (CEBQ)[26] is a 34-item reliable and valid parent-report measure of children's eating behaviors. Picky eating was measured with the 6-item Food Fussiness Subscale of the CEBQ. The Food Fussiness Subscale assesses both food neophobia (fear of eating new foods) and picky eating and is generally thought to capture developmentally typical picky eating.[26] Example questions include "my child refuses new foods at first, my child is difficult to please with meals, and my child enjoys a wide variety of foods." Parents responded on a 5-point scale (1=never; 5=always) and responses are averaged (Cronbach's alpha = 0.88).

Child, Parent, and Family Characteristics as Potential Predictors of Picky Eating

Parents reported child sex, race/ethnicity, and birth date (from which age in months was calculated) as well as single parent household status. Maternal depressive symptoms were assessed with the Center for Epidemiologic Studies-Depression scale (CES-D), a 20-item measure of depressive symptoms in the general population that has been shown to be valid and reliable across a wide range of demographic characteristics.[27] Scores range from 0–60 with higher scores indicating more severe depressive symptoms. Food insecurity was categorized as food secure versus not based on the US Department of Agriculture Food Security Scale.[28] We created a measure of difficult temperament by calculating the mean of the anger (6 items, 1 reversed), soothability (6 items, 3 reversed), impulsivity (6 items, 3 reversed), and inhibitory control (6 items, 1 reversed) subscales of the validated and reliable Children's Behavior Questionnaire (CBQ)[29] short form. These four subscales were chosen to reflect increased reactivity and negative affect,[30] hallmarks of difficult temperament. Parents responded to items on a scale from 1= extremely untrue to 7= extremely true and responses are averaged (Cronbach's alpha =0.78), with higher scores reflecting a more difficult temperament.

Anthropometry and Dietary Outcomes

Research staff measured participants' weight and height in duplicate without shoes or heavy clothing using a Detecto Portable Scale Model #DR550C and a Seca 213/217 portable stadiometer. Mother and child BMI were calculated and child BMI z-score derived using United States Centers for Disease Control reference growth curves for age and sex. Child underweight was defined as a BMI $<5^{th}$ percentile, child overweight as BMI $\geq 85^{th}$ percentile and $< 95^{th}$ percentile, and child obesity as BMI $\geq 95^{th}$ percentile for age and sex, respectively. Maternal BMI was categorized per standard definitions, with a BMI of <18.5 considered underweight, 18.5–24.9 considered healthy weight, 25–29.9 considered overweight, and >30 considered obese.

Three unannounced 24-hour dietary recalls were collected via phone by trained dietitians from parents regarding child intake, using the Nutrition Data System for Research program.[31] Families were provided handouts showing child-appropriate portion sizes to assist. Recalls were collected for 2 weekdays and one weekend day over a 2–3 week period. Research staff observed and recorded what children ate at Head Start programs during the school day corresponding to the weekday recall and these data were incorporated into the recall. Of the 480 children who completed dietary data, 286 provided at least 3 recalls, 132 2 recalls, and 62 1 recall. Three recalls were completed in 59% of the study population due to difficulties reaching this high risk population by telephone and parents not being with their child on the day of the recall and therefore unable to report their child's dietary intake. When comparing those who completed at least 3 recalls versus those who completed 1 or 2, there were no differences with regards to child age, sex, or race/ethnicity, household food security, or parental marital status. However, those who completed 3 or more recalls had higher maternal BMI compared to those who completed 1 or 2 recalls (32.44 vs. 29.55, p=0.0003).

Recalls with implausible kilocalorie counts (<1.5% of all recalls) were removed prior to analysis using established criteria. Variables reflecting servings per day were generated for foods and food groups. We used the Healthy Eating Index-2010 (HEI) to evaluate dietary quality; the HEI consists of 12 components, including nine adequacy components and three moderation components (see specification of components in Table 3).[32] We also examined mean daily intake of select micronutrients necessary for optimal growth and development; vitamins A, C, E, and B6, folate, calcium, potassium, iron, zinc, and magnesium. We also examined the proportion of participants meeting the Dietary Reference Intake (DRI).[33]

Statistical analysis

Our sample was limited to participants with complete data for all covariates for the first two objectives (N=506), and further limited to those participants with complete dietary data for the third objective (N=480). We used univariate analysis (mean and standard deviation for continuous variables and frequency for categorical variables) to describe the sample and unadjusted bivariate analysis (Spearman's correlation for continuous variables and paired t-test for categorical variables) to describe covariates in relation to the CEBQ Food Fussiness Subscale score. We checked distributions of all variables, and as nutrients and HEI subgroups had non-normal distributions, Spearman's correlation was used to assess correlation with the CEBQ Food Fussiness Subscale. Significance was assessed using a two-sided test at $\alpha = 0.05$.

To test the association of child, parent, and family characteristics with picky eating we created a multivariable linear regression model in which the outcome was CEBQ Food Fussiness score and the predictors were the child, parent, and family characteristics associated with CEBQ Food Fussiness in unadjusted bivariate associations with $p < 0.2$. Predictors were entered simultaneously into the models.

To test the association of picky eating with child BMIz we created a multivariable linear regression model with the predictor CEBQ Food Fussiness Subscale score and the outcome child BMIz, adjusting for covariates: child sex (male vs. female), child race/ethnicity (black/

white/Hispanic/other), child age (continuous, in months), household food insecurity (food insecure vs. not), single parent household status, maternal BMI (continuous), and maternal depressive symptoms (CED-D score, continuous). We reran this model for outcomes child weight-for-height z-score and child height z-score. We also computed three additional logistic regression models with outcomes child obesity (BMI ≥ 95th percentile), child overweight/obesity (BMI ≥ 85th percentile), and child BMI less than the 25th percentile for age and sex. The 25th percentile was chosen as a cut point to identify children with lower weight status to provide sufficient power, given that the number of children who were underweight (i.e., BMI < 5th percentile) in this sample was small.

To test the hypothesis that picky eating is associated with lower dietary quality and micronutrient intake we created a linear regression model for each of the dietary outcome measures and a logistic regression model for each of the micronutrients meeting the DRI (versus not), testing CEBQ Food Fussiness score as a predictor and adjusting for the covariates above. We chose not to adjust for total energy intake as we felt that overall intake is an important component of parents' perception of picky eating. Log transformation of dietary variables was performed; however, results were not significantly different from non-transformed results so we present the non-transformed analysis here for ease of understanding. All analyses were done in SAS 9.3.

RESULTS

Characteristics of the study sample (n=506) are shown in Table 1. Male sex, more difficult temperament, and higher maternal CES-D were each associated with higher CEBQ Food Fussiness scores in unadjusted analyses (Table 1). Food fussiness was not associated with child race/ethnicity or age, household food insecurity, single parent household status, or maternal BMI (Table 1). In the adjusted linear regression model, male child sex, older child age, and more difficult temperament were each independently associated with higher CEBQ Food Fussiness score (Table 2).

There was no significant association between CEBQ Food Fussiness Subscale score and child BMIz, weight-for-height z-score, height z-score, or weight status in unadjusted (Table 1) or adjusted analysis (adjusted β= −0.07, SE 0.05, p= .19; β= −0.08, SE 0.05, p= 0.09; β= −0.05, SE 0.05, p= 0.26, for BMIz, weight-for-height z-score, and height z-score, respectively; OR 0.88, 95% CI 0.68–1.15 for obesity, OR 1.02, 95% CI 0.83–1.25 for overweight/obesity and OR 1.19, 95% CI 0.96–1.48 for BMI in the lowest quartile.

In unadjusted analysis, CEBQ Food Fussiness score was inversely associated with HEI overall and adequacy scores, whole fruit, total vegetables, greens and beans, and total protein foods (Table 3), but there was no association with mean daily micronutrient intake (Table 4) or proportion meeting the DRI (Table 5) with the exception of iron, in which the mean food fussiness score was higher among children who met DRI requirements (2.89 vs. 2.68, p=0.01, table 5). The results were unchanged in the adjusted models (Table 6).

DISCUSSION

This study makes several new contributions to the literature that may guide providers counseling parents. First, picky eating was associated with some child factors (such as male sex and difficult temperament) but not maternal or family factors, such as food insecurity, single parent household, or maternal BMI. Second, picky eating was not associated with child BMIz, weight-for-height z-score, height z-score, or weight status categories. Finally, picky eating was associated with lower HEI overall and adequacy scores; however, there was no association with micronutrient levels.

Our finding that having a difficult temperament is associated with more picky eating aligns with prior work, particularly studies finding that a more anxious temperament is associated with more picky eating.[34] Picky eating may be a behavioral manifestation of a temperament characterized by greater emotionality. Alternatively, parents of children with an anxious temperament or low frustration tolerance may be more likely to have these temperamental traits themselves.[35] These parents may be more anxious or frustrated by normative eating behaviors, and therefore more likely to express concern to the pediatrician. Additionally, parents may be more likely to express concern about picky eating for their children who are older or males. For these parents, pediatric providers could show the growth curve, advise that the child has healthy growth, and reassure that picky eating during early childhood is not associated with a deficiency in important vitamins or minerals. Future work is needed to disentangle potentially skewed parental perception of normative child eating behaviors from inherent child characteristics to inform the specific guidance from pediatric providers.

We found no association between picky eating and weight status, which is also consistent with most other prior work in this field.[4,11,12] Many previous studies that identified an association between picky eating and underweight[8,13] did not use the Food Fussiness Subscale, which likely contributes to the disparate findings. Picky eating exists on a spectrum, and studies using a more extreme definition of picky eating[13] were more likely to find an association with underweight. While our study relied exclusively on parental report of picky eating, it is unclear how a child's weight status might influence these parental perceptions. For example, parents of a child with obesity may offer more high calorie and palatable foods if they believe their child is a picky eater. Alternatively, parents of underweight children may be more likely to describe their child as picky to explain their low-weight status. Future research will need to delineate the spectrum of picky eating to help providers distinguish developmentally typical picky eating (as measured by the Food Fussiness Subscale) from "pathological" picky eating in which children's growth may be adversely affected. We also found that food fussiness was not associated with child race/ethnicity, household food insecurity, single parent household status, or maternal BMI, which is consistent with previous research.[16,19]

Our results were also consistent with previous studies which found a lower number of foods consumed by picky eaters,[4,6] especially fruits and vegetables.[4,5,18] Similarly, we documented a marginal negative association of food fussiness with "empty calories" in the HEI, consistent with earlier reports of lower intake of fats and sweets among picky eaters.[18] Some previous studies found an association between picky eating and lower vitamin and

mineral intakes,[6,18] which is not consistent with our null findings. However, these studies had a less diverse[6,18] and older[18] sample, and defined picky eating as single question items regarding "does not eat well" and "refuses to eat."[6] In summary, more severe types of picky eating may be linked with lower micronutrient intake, but the type of picky eating captured in our study, which is arguably less severe, did not show an association with lower micronutrient intake. The HEI is a measure of overall dietary quality, and reflects guidance to reduce chronic health risks, whereas the DRI is a measure of adequacy of nutrient intake to support basic physiologic functions. While a healthy diet is likely to contribute overall nutrient adequacy, it is possible that actual foods consumed (and scored in foods groups in the HEI) may or may not be highest sources of vitamins and minerals, thus isolated inadequacies could occur.

There are several limitations to this study. Our findings may not be generalizable to other populations and cultures, as participants in this study were low-income English-speaking mothers of 3–4 year old children who were recruited from a single geographical area. The Food Fussiness Subscale of the CEBQ includes questions related to both food neophobia (a fear of eating new foods) and picky eating; separating these two concepts in future work will be an important next step. While 24 hour dietary recall is the gold standard for assessing child dietary intake, we were only able to complete 3 recalls in 59% of our study population. This study relied exclusively on parental report of picky eating and dietary intake, which is consistent with most prior work in this field but may be affected by parental misperceptions of their child's eating behaviors.[36] Additionally, this was a cross-sectional study so conclusions cannot be drawn about temporality; future work should examine these associations over time. While we attempted to control for covariates that are known to be associated with picky eating, there may be additional unmeasured confounding, such as home chaos or maternal perception of her child's weight status. Finally, multiple comparisons were made and it is possible that some significant associations were due to chance alone.

Our study found that low-income preschoolers who are boys and who have more difficult temperaments were more likely to be described by their mothers as pickier eaters. However, being described as a pickier eater was not associated with any detectable differences in BMIz, weight status, or micronutrient intake, although it was linked with lower reported intake of fruits, vegetables and proteins. Overall, our results suggest that providers should support parents in expanding the number of healthy foods the child eats to improve dietary quality, but reassure parents that picky eating is not associated with children's weight status or micronutrient intake. Parents should communicate with their pediatrician about any concerns they have about their child's eating behaviors. For children who have a healthy growth trajectory (which is the vast majority of picky eaters), pediatric providers should reassure these parents that their child's growth is healthy and inform parents that picky eating during early childhood is not associated with a deficiency in important vitamins or minerals. Nutritionists, schools, child care centers, Women Infant and Children (WIC) programs, and Head Start programs also play important roles in nutrition education. Providers should counsel parents and child care providers to avoid feeding behaviors that could be counterproductive, such as negotiating with food, pressuring to eat, using food as a reward, or offering separate meals. Although these behaviors can sometimes lead to a

temporary increase in intake of the desired food,[37] over a long period of time they may decrease the child's exposures to healthy and nutritious foods[36] and "reinforce the notion that healthy foods are not palatable or desirable."[38] Interventions that reduce parental anxiety about picky eating and promote continued exposure to new foods are likely to be the most effective[36] and require additional study.

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Abbreviations

BMI	body mass index
BMIz	body mass index z-score
HEI	Healthy Eating Index
CEBQ	Children's Eating Behavior Questionnaire
CBQ	Children's Behavior Questionnaire

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What's New

In this low-income sample, picky eating was more common among boys, older preschoolers, and children with a difficult temperament. Picky eating was associated with lower overall dietary quality, but not with micronutrient deficiencies or child body mass index z-score (BMIz).

Table 1

Sample Characteristics and Unadjusted Bivariate Associations with Food Fussiness (n = 506)

Categorical Variables	**Overall Sample N (%)**	**Mean (SD) of Food Fussiness**	**P-value[a]**
Child Sex			0.004
Male	246 (48.62)	2.92 (0.96)	
Female	260 (51.38)	2.68 (0.93)	
Child Race/Ethnicity			0.63
Non-Hispanic White	252 (49.8)	2.79 (0.93)	
Non-Hispanic Black	148 (29.25)	2.74 (0.97)	
Hispanic	59 (11.66)	2.92 (0.89)	
Other	47 (9.29)	2.85 (1.08)	
Child Weight Status			0.33
Underweight	14 (2.77)	3.10 (0.99)	
Healthy Weight	315 (62.25)	2.75 (0.95)	
Overweight	98 (19.37)	2.92 (1.02)	
Obese	79 (15.61)	2.75 (0.88)	
Maternal BMI Classification			0.80
Underweight /Healthy Weight	130 (25.69)	2.75 (0.97)	
Overweight	125 (24.70)	2.79 (0.95)	
Obese	251 (49.80)	2.82 (0.95)	
Household Food Insecurity			0.72
Food Secure	311 (61.46)	2.81 (0.95)	
Food Insecure	195 (38.54)	2.78 (0.96)	
Single Parent Home			0.70
Yes	290 (57.31)	2.78 (0.94)	
No	216 (42.69)	2.81 (0.96)	
Continuous Variables	Overall Sample Mean (SD)	Correlation with Food Fussiness	P-value[b]
Child Age (in months)	49.31 (6.25)	0.08	0.08
Child BMIz	0.64 (1.17)	−0.03	0.66
Child Weight-for-Height Z Score	0.53	1.04	0.35
Child Height-for-Age Z Score	0.30	1.03	0.23
CBQ Difficult Temperament Subscale Score *	4.01(0.66)	0.15	0.001
Maternal BMI	31.38 (8.77)	0.08	0.09
Maternal CES-D Total Score	13.43	10.27	0.04

* n=503 for Difficult Temperament

[a] Assessed by paired t-test

[b] Assessed by Spearman's correlation

Table 2

Adjusted Associations of Covariates with CEBQ Food Fussiness Subscale Score in Multivariable Linear Regression Analysis [a] (n = 503)

	Beta (SE)	p-value
Child Sex Male	0.20 (0.08)	0.01
Child Age (months)	0.01 (0.01)	0.048
CBQ Difficult Temperament Subscale Score	0.20 (0.07)	0.004
Maternal BMI	0.01 (0.005)	0.11
Maternal Depressive Symptoms	0.005 (0.004)	0.29

[a] Significant predictors in bivariate analysis were simultaneously entered into the adjusted linear regression model

Table 3

Unadjusted Associations of Food Fussiness with Healthy Eating Index (HEI) Scores

	Maximum Points	Total Sample Mean (SD)	Correlation with Food Fussiness	p-value
HEI-2010	100	59.7 (10.9)	−0.13	0.006
Adequacy	60	33.2 (7.0)	−0.15	0.001
Total Fruit	5	3.3 (1.7)	−0.08	0.08
Whole Fruit	5	2.9 (1.9)	−0.13	0.005
Total Vegetables	5	1.8 (1.1)	−0.21	<0.001
Greens and Beans	5	0.7 (1.3)	−0.07	0.14
Whole Grains	10	4.6 (3.3)	−0.06	0.16
Dairy	10	8.5 (2.2)	0.08	0.07
Total Protein Foods	5	4.0 (1.2)	−0.13	0.003
Seafood and Plant Proteins	5	1.7 (2.0)	−0.01	0.78
Fatty Acids	10	1.6 (0.5)	−0.003	0.94
Moderation	40	26.4 (5.5)	−0.05	0.29
Refined Grains	10	6.3 (3.0)	−0.04	0.36
Sodium	10	4.9 (2.9)	0.04	0.37
Empty Calories	20	15.3 (3.6)	−0.06	0.16

Table 4

Unadjusted Associations of Mean Daily Micronutrient Intake With Food Fussiness[1]

Nutrient	Mean daily intake (SD)	r	p-value
Vitamin A (ug RAE)	3764.9 (5366.0)	0.03	0.55
Vitamin C (mg)	72.9 (50.5)	−0.06	0.16
Vitamin E (mg)	8.1 (4.2)	−0.01	0.75
Folate (ug)	308.2 (130.8)	0.01	0.74
Vitamin B6 (mg)	1.3 (0.5)	−0.04	0.36
Calcium (mg)	898.3 (333.6)	0.06	0.22
Potassium (mg)	1793.0 (610.3)	−0.07	0.10
Iron (mg)	11.1 (4.5)	0.06	0.16
Zinc (mg)	8.4 (3.2)	−0.003	0.93
Magnesium (mg)	184.7 (57.0)	−0.06	0.16

[1]Adjusted for mean daily energy intake

Table 5

Unadjusted Associations of Food Fussiness with Adequacy of Micronutrient Intake as Determined by Dietary Reference Intakes (DRI)[1]

Nutrient	Does Not Meet DRI Requirements Mean (SD)	Meets DRI Requirements Mean (SD)	p-value
Vitamin A (ug RAE)	2.77 (0.91)	2.80 (0.98)	0.77
Vitamin C (mg)	2.75 (0.86)	2.80 (0.85)	0.85
Vitamin E (mg)	2.93 (0.93)	2.77 (0.96)	0.23
Folate (ug)	2.80 (0.93)	2.79 (0.98)	0.92
Vitamin B6 (mg)	2.79 (0.77)	2.79 (0.99)	0.98
Calcium (mg)	2.74 (0.94)	2.89 (0.99)	0.1
Iron (mg)	2.68 (0.88)	2.89 (1.01)	0.01
Zinc (mg)	2.82 (0.87)	2.79 (0.97)	0.39
Magnesium (mg)	2.73 (0.85)	2.80 (0.58)	0.58

[1] <1% of participants met the recommended daily intake of potassium, so these values are not reported here.

Table 6

Adjusted Associations of Food Fussiness with Healthy Eating Index (HEI) Scores and Micronutrient Intake[1]

	Linear regression models testing association of food fussiness with HEI and micronutrients		Logistic regression models testing odds of meeting recommended daily intake (DRI)	
	Beta (SE)	**p-value**	**OR**	**95% CI**
Healthy Eating Index-2010	−1.32 (0.51)	0.01	–	–
Adequacy	−1.13 (0.33)	0.001	–	–
Total Fruit	−0.17 (0.08)	0.04	–	–
Whole Fruit	−0.25 (0.09)	0.01	–	–
Total Vegetables	−0.24 (0.05)	<.0001	–	–
Greens and Beans	−0.13 (0.06)	0.04	–	–
Whole Grains	−0.22 (0.16)	0.16	–	–
Dairy	0.06 (0.10)	0.54	–	–
Total Protein Foods	−0.18 (0.05)	0.001	–	–
Seafood and Plant Proteins	0.01 (0.09)	0.88	–	–
Fatty Acids	0.01 (0.02)	0.76	–	–
Moderation	−0.20 (0.26)	0.44	–	–
Refined Grains	−0.04 (0.14)	0.77	–	–
Sodium	0.16 (0.14)	0.23	–	–
Empty Calories	−0.32 (0.17)	0.05	–	–
Vitamin A (ug RAE)	−286.27 (256.88)	0.27	1.00	0.81–1.24
Vitamin C (mg)	−2.48 (2.39)	0.30	0.96	0.55–1.67
Vitamin E (mg)	0.03 (0.20)	0.88	0.85	0.64–1.13
Folate (ug)	−2.85 (6.19)	0.64	0.98	0.81–1.19
Vitamin B6 (mg)	−0.02 (0.02)	0.29	0.95	0.74–1.23
Calcium (mg)	22.49 (15.59)	0.15	1.15	0.93–1.40
Potassium (mg)[2]	−47.58 (28.90)	0.10	–	–
Iron (mg)	0.02 (0.21)	0.92	1.22	0.99–1.48
Zinc (mg)	−0.01 (0.15)	0.97	0.91	0.65–1.27
Magnesium (mg)	−5.21 (2.69)	0.053	1.08	0.81–1.43

[1] Separate regression models were created for each dietary outcome, all adjusted for child sex, child race/ethnicity, child age, maternal BMI, maternal depressive symptoms, household food insecurity, and single parent household

[2] <1% of participants met the recommended daily intake of potassium, so this value is not reported here.