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Examining Variability in Parent Feeding Practices Within a Low-Income, Racially/Ethnically Diverse, and Immigrant Population using Ecological Momentary Assessment

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Abstract

Background—Current measures of parent feeding practices are typically survey-based and assessed as static/unchanging characteristics, failing to account for fluctuations in these behaviors across time and context. The current study uses ecological momentary assessment to examine variability of, and predictors of parent feeding practices within a low-income, racially/ethnically diverse, and immigrant sample.

Methods—Children ages 5–7 years old and their parents (n=150 dyads) from six racial/ethnic groups (n=25 from each; Black/African American, Hispanic, Hmong, Native American, Somali, White) were recruited for this mixed-methods study through primary care clinics.

Results—Among parents who used restriction (49%) and pressure-to-eat (69%) feeding practices, these feeding practices were utilized about every other day. Contextual factors at the meal associated with parent feeding practices included: number of people at the meal, who prepared the meal, types of food served at meals (e.g., pre-prepared, homemade, fast food), meal setting (e.g., kitchen table, front room), and meal emotional atmosphere ($p<0.05$). Parents tended to restrict desserts, dairy, and vegetables and pressure children to eat fruits, vegetables, meat proteins, and refined grains ($p<0.05$). There were some differences by race/ethnicity across

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findings ($p<0.01$), with Hmong parents engaging in the highest levels of pressure-to-eat feeding practices.

Conclusions—Parent feeding practices varied across the week, indicating they are more likely to be context-specific, or state-like than trait-like. There were some meal characteristics more strongly associated with engaging in restriction and pressure-to-eat feeding practices. Given that parent feeding practices appear to be state-like, future interventions and health care providers who work with parents and children may want to address contextual factors associated with parent feeding practices to decrease restriction and pressure-to-eat parent feeding practices.

Keywords

Parent feeding practices; ecological momentary assessment; minority; low-income; immigrants

INTRODUCTION

Previous studies have shown that parent feeding practices such as food restriction and pressure-to-eat are associated with overweight,[1–3] unhealthy diet quality,[2–4] lower satiety responsiveness,[5,6] and unhealthy weight control behaviors[7] in children and adolescents. Thus, parent feeding practices may be an important parental factor to target to reduce childhood obesity. However, there are many remaining questions about parent feeding practices that are important to address in order to know how to intervene on parent feeding practices effectively. Some questions include: (1) do parent feeding practices vary across the week (i.e., state-like), or are they stable (i.e., trait-like)?; (2) are there contextual factors during meals (e.g., meal atmosphere, who is present at the meal) that are associated with whether parents use one type of parent feeding practice or another?; (3) do parents restrict or pressure certain types of foods more or less? Addressing these questions will allow for developing interventions that can potentially alter parent feeding practices to thereby reduce childhood obesity.

Understanding whether parent feeding practices are constant or fluctuating is key for the development of interventions that can alter parent feeding practices. For example, if feeding practices vary across time and context, then targeting real-time predictors of parent feeding practices in interventions could potentially result in decreased restriction and pressure-to-eat feeding practices. To the best of our knowledge, prior research on parent feeding practices has relied primarily on survey assessments and has not examined whether parent feeding practices vary across different contexts. This is problematic because survey or self-report items assume parent feeding practices are static/unchanging characteristics, or trait-like.

Use of assessment tools that can capture fluctuations in behavior such as ecological momentary assessment (EMA) are necessary for understanding whether food-related parenting practices are constant (i.e., trait-like), or if they fluctuate across time and context (i.e., state-like).[8–12] EMA has several advantages. EMA allows for observing behaviors as they unfold, moment-by-moment, to capture dynamic changes in behavior that are relevant to the participant's real world environment. EMA also removes the need for retrospective recall. The current study assesses parent feeding practices via EMA, which measures within- and between-subject variation to determine whether parent feeding practices are state-like

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and influenced by momentary mechanisms such as meal characteristics that can be intervened on in real-time, or whether they are trait-like.

It is also important to identify contextual factors occurring during the meal that are associated with using certain feeding practices. For example, if meal characteristics such as the meal atmosphere (e.g., tense, chaotic, relaxed, enjoyable) or meal type (e.g., fast food, homemade) are associated with engaging in one type of parent feeding practice or the other, then these meal characteristics can be targeted in interventions to reduce the likelihood of parents engaging in controlling parent feeding practices. Previous studies examining mealtime characteristics associated with parent feeding practices have mostly been qualitative and have found that parents identify meal characteristics such as the emotional atmosphere at the meal and distractions at the meal (e.g., screen time, TV) as contextual factors that influence why they use certain parent feeding practices.[13,14] Quantitative studies are a necessary next step to identifying whether these associations are statistically significant. In addition, identifying which foods parents are more likely to pressure or restrict at meals would be useful in determining how to intervene with parents around specific parent feeding practices.

Examining parent feeding practices in parents from low-income, racially/ethnically diverse, and immigrant/refugee (e.g., Hmong, Somali) populations is also needed to determine whether parents operate similarly or differently with regard to parent feeding practices in diverse families.[15–17] Prior research on parent feeding practices using survey research has shown that parents from low-income and minority households may be more likely to engage in restriction and pressure-to-eat feeding practices.[18,19] In the current study, EMA data will be used to allow for examining variability in parent feeding practices by race/ethnicity, in addition to immigrant/refugee status.

The current study will build on and expand prior research on parent feeding practices by utilizing EMA methods to examine parent feeding practices within a low income, racially/ethnically diverse, and immigrant population. Although parent feeding practices have sometimes been conceptualized differently by researchers in the field, the current study utilizes Vaughn's conceptualization of parent feeding practices, specifically coercive feeding practices (i.e., restriction, pressure-to-eat).[20–22] The main research questions addressed in the current study include: (1) What types of parent feeding practices do parents engage in across the week, do they vary, and do they differ by race/ethnicity?, (2) What meal characteristics or contextual factors are associated with parent restriction or pressure-to-eat feeding practices; and (3) What foods do parents restrict and pressure most? The main hypothesis of the current study is that parent feeding practices will fluctuate across time and context (i.e., state-like) rather than remain stable (i.e., trait-like).

METHODS

Data for the current study are from *Family Matters*,[23] a National Institutes of Health- funded study. *Family Matters* is a 5-year incremental (Phase I = 2014–2016.; Phase II = 2017–2019), mixed-methods (e.g., video-recorded tasks, EMA, interviews, surveys) longitudinal study designed to identify novel risk and protective factors for childhood obesity in the home

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environments of racially/ethnically diverse and primarily low-income children. Phase I included an in-depth, mixed-methods, cross-sectional examination of the family home environment of diverse families (n=150). Phase II will be a longitudinal epidemiological cohort study with diverse families (n=1200).

Data in the current study are from Phase I of the *Family Matters* study. In Phase I, a mixed-methods analysis of the home environments of children ages 5–7 years old from racially/ethnically diverse households was conducted to identify individual, dyadic, and familial risk and protective factors for childhood obesity. The University of Minnesota's Institutional Review Board Human Subjects Committee approved all protocols used in both phases of the *Family Matters study.*

Recruitment and Eligibility Criteria

Eligible children (n=150) and their families were recruited from the Minneapolis/St. Paul, MN area between 2015–2016 via a letter from their family physician. Children were eligible to participate in the study if they were between the ages of 5–7 years old, had a sibling between the ages of 2–12 years old living in the same home, lived with their parent/primary guardian more than 50% of the time, shared at least one meal/day with the parent/primary guardian, and were from one of six racial/ethnic categories (Black/African American, Hispanic/Latino, Hmong, Native American, Somali, and White). The sample was intentionally stratified by race/ethnicity and weight status (overweight/obese=BMI ≥85%ile; non-overweight=BMI >5%ile and <85%ile) of the study child to identify potential weight- and/or race/ethnic-specific home environment factors related to obesity risk.

Procedures and Data Collection

A 10-day in-home observation was conducted with each family, including an 8-day direct observational period bookended by two in-home visits. During home visit one (day 1): (1) families consented and assented to be in the study; (2) heights and weights were taken on all family members; (3) family members engaged in an interactive observational family task (i.e., a family board game with activities about family meal planning, meal preparation, and family physical activity) to measure family functioning and parenting practices that was developed specifically for this diverse study population based on prior validated direct observational measures;[24] (4) a 24-hour child dietary recall was conducted with the parent using Nutrition Data System for Research software and a multiple pass method[25] (NDSR, three 24-hour dietary recalls),[26] (5) a home food inventory (HFI)[27,28] was carried out; and (6) families were trained in accelerometry and EMA data collection. During the eight-day direct observational period (days 2–8), the primary parent/guardian (i.e., person who cared for child the majority of the time and was primarily responsible for feeding the child) completed EMA[8] surveys daily, the child and parent wore accelerometry belts (Actigraph GT1M model, Fort Walton Beach, FL),[29,30] and a second 24-hour child dietary recall was conducted. During the second home visit (day 10): (1) a third 24-hour child dietary recall was conducted; (2) an online survey was taken by the primary parent; (3) a block audit on the built environment was carried out; and (4) a qualitative interview was conducted with the primary parent. All written study materials were translated into Spanish, Somali, and Hmong and bilingual staff were available at all home visits, allowing families to complete study

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related activities in their preferred language. In-depth details regarding both Phases of the *Family Matters* study and all study elements (e.g., EMA, family observational task, block audit, qualitative interview) have been published elsewhere.[23]

This study included a community-engaged process with a community-based research[31] team named SoLaHmo (stands for Somali, Latino, and Hmong) Partnership for Health and Wellness. SoLaHmo partnered with the UMN research team throughout Phase I on recruitment, survey development/translation/pilot testing, in-home data collection, coding parent interviews, and analysis.

Sample demographics

The study sample included diverse families who were equally distributed across the six racial/ethnic groups recruited in the study (Black/African American, Hispanic, Hmong, Native American, Somali, White). Additionally, families were from low-income households, with 70% of families earning less than $35,000 per year. The majority of participants were mothers (91%) who were approximately 35 years old (mean = 34.5; sd = 7.1) with children aged 6 years old (mean = 6.4; sd= 0.08). Over half of the mothers worked full or part time and 61% had a high school diploma or less. About half of the mothers were married and 64% of households had two parents.

Measures

Variables measured via EMA and used in analyses including, parent feeding practices, foods served at meals, and meal characteristics are described in Table 1.

Statistical Analysis

Descriptive analyses and panel data tabulations were performed to describe the sample, evaluate modeling assumptions, and examine variation in parent behaviors over the observation period. Demographic characteristics of the parent subsamples with variation in restriction (n=72) and pressuring (n=100) parent feeding practices were tabulated, and Fisher's exact tests were performed to determine if the analytic subsamples differed from those without variation in the behavior (Table 1). Random effect logit models (i.e., a type of growth curve modeling) for panel data were applied to examine how categorical predictor variables were statistically related to dichotomous outcome variables: 1) restriction, 2) pressuring, and 3) the foods types specifically restricted or pressured at meals. Marginal probabilities and logit-bounded 95% confidence intervals were calculated to describe the magnitude of associations and differences between predictor levels on an absolute scale (as opposed to a multiplicative scale; e.g., odds ratios). Pairwise comparisons were performed at a type I error rate of 0.05 to describe the sources of statistical differences between levels of the predictor variables. All models are presented with adjustment for parent and child sex, age, and weight status, child race, and household income. Interpretation examples are provided in each table to assist in the interpretation of study findings. All analyses were performed in Stata 15.1SE (College Station, TX).

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RESULTS

The current study addresses variability in parent feeding practices, thus results are presented only for the parent sample who had variability in feeding practices across the week (i.e., excludes parents who always or never engaged in these feeding practices). Table 2 shows that 72 parents engaged in restrictive feeding practices and 100 parents engaged in pressure-to-eat feeding practices at least one time across the week. These categories were not mutually exclusive; in other words, participants could use both restriction and pressure-to-eat feeding practices (e.g., 86% of the parents who restricted foods also engaged in pressure-to-eat feeding practices; Table 4). There were no statistically significant differences in demographic characteristics between parents with and without variability in their feeding practices (Table 2).

Parent Feeding Practices Across the Week and Differences by Race/Ethnicity

The likelihood of parents engaging in pressure-to-eat feeding practices was low to moderate (0.12 and 0.18) across days of the week, with parents engaging in the most pressure-to-eat feeding practices in the middle of the week (i.e., Wednesday and Thursday; $p<0.05$), relative to weekend days (i.e., Sunday; $p<0.05$) (Table 3). There were no statistical differences in the likelihood of engaging in restrictive feeding practices across week days.

Hmong parents had the highest likelihood of engaging in pressure-to-eat feeding practices (0.32; 95% CI: 0.22, 0.43) relative to Black/African American (0.04; 95% CI: 0.02, 0.08), Hispanic (0.09; 95% CI: 0.05, 0.16), Native American (0.13; 95% CI: 0.08, 0.21), and Somali (0.15; 95% CI: 0.09, 0.23) parents ($p<0.05$) (Table 3). There were no statistically significant differences between racial/ethnic groups on restrictive feeding practices.

Variability of Parent Feeding Practices

Between-parent analyses showed that 69% of parents used pressure-to-eat feeding practices at least once across the week, and 49% of parents used restrictive feeding practices at least once across the week (n=150) (Table 4). Within-parent analyses showed that parents used either restriction or pressure-to-eat feeding practices at approximately 1 in 5 meal occasions across the week, which translates into about once every other day. For example, parents who used restrictive feeding practices at least once did so at 22% of their meals, and those who used pressure-to-eat feeding practices at least once, did so at 20% of their meals. With regard to specific meals, parents most frequently engaged in pressure-to-eat feeding practices at dinners (51%), and least frequently engaged in pressure-to-eat feeding practices at lunches (31%), however, the within-parent variability of both restriction and pressuring was highest at lunches (50% and 51% respectively).

Meal Characteristics Associated with Restriction or Pressure-to-Eat Feeding Practices

Several meal characteristics/contextual factors were significantly associated with parent feeding practices across meal occasions (e.g., breakfast, lunch, dinner, snacks) (Table 5). Meal type (i.e., homemade, fast food, and pre-prepared), number of adults at the meal (i.e., two or more adults), who prepared the meal (i.e., partner), meal setting (i.e., scattered throughout the house), and emotional atmosphere at the meal (i.e., chaotic, tense) were

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predictive of parent restriction feeding practices at the meal ($p<0.001$). For example, the probability of parents engaging in restrictive feeding practices was highest when fast food was combined with homemade and pre-prepared (e.g., macaroni and cheese, frozen meals) meals (0.35, 95% CI: 0.19, 0.56) and lowest when the meal contained only homemade food (0.10, 95% CI: 0.08, 0.14). In addition, meal type (i.e., fast food + homemade), meal setting (i.e., at table), and reasons for serving specific foods at the meal (i.e., was available where we ate) were statistically predictive of parent pressure-to-eat feeding practices at the meal ($p<0.001$).

Probability of Foods Restricted or Pressured and Differences by Race/Ethnicity

Pressure-to-eat feeding practice patterns in the overall sample showed that parents had the highest probability of pressuring their child to eat vegetables (0.45, 95% CI: 0.39, 0.51), followed by meat proteins (0.34, 95% CI: 0.29, 0.40), fruits (0.24, 95% CI: 0.19, 0.31) and refined grains (0.24, 95% CI: 0.21, 0.27) across all meal occasions (Table 6). Additionally, probabilities for engaging in pressure-to-eat feeding practices differed significantly across racial/ethnic groups for meat proteins, fruits, and refined grains ($p<0.01$ or less). For example, pairwise comparisons indicated that Black/African Americans had the highest likelihood of pressuring meat proteins (0.57, 95% CI: 0.32, 0.78) which was statistically different ($p<0.05$) from Somali parents (0.13, 95% CI: 0.07, 0.23). Additionally, White, Hmong, and Native American parents were statistically significantly higher than Somali parents on pressuring meat proteins ($p<0.05$).

Restrictive feeding practice patterns in the overall sample showed that parents had the highest probability of restricting their child from eating vegetables (0.22, 95% CI: 0.16, 0.29), followed by cakes, desserts or candy (0.21, 95% CI: 0.16, 0.28), and dairy (0.18, 95% CI: 0.13, 0.24) across all meal occasions (Table 6). Additionally, probabilities for engaging in restrictive feeding practices significantly differed across racial/ethnic groups for meat proteins and vegetables ($p<0.01$ or less).

DISCUSSION

Overall, results of the current study indicate that parent feeding practices were moderately variable across the week, with parents engaging in either restriction or pressure-to-eat feeding practices about 20% of the time. Given the high frequency of meals in this sample, this means that over half of parents used restrictive or pressure-to-eat feeding practices one in five meals, or approximately every other day. These results suggest that parent feeding practices fluctuate over time and across contexts, or are state-like versus trait-like. This new finding extends prior research using survey-based or static measures of parent feeding practices and suggests that measuring and intervening on parent feeding practices may best be approached with the perspective that they are state-like, or variable across time.[19,23,32]

Study results regarding parents engaging in variable amounts of restriction and pressure-to-eat feeding practices across the week suggest that again, parent feeding practices are more likely to be state-like than trait-like. Specifically, parents may be more likely to engage in pressure-to-eat feeding practices in the middle of the week (i.e., Wednesday, Thursday). This result supports findings from one of our prior studies showing that parents reported more

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stress towards the middle of the week, which resulted in an increased likelihood of engaging in pressure-to-eat feeding practices and in serving less homemade and more pre-prepared (e.g., macaroni and cheese, frozen meals) foods.[19] Results examining parent feeding practices by race/ethnicity showed that Hmong parents engaged in significantly more pressure-to-eat feeding practices compared to all other racial/ethnic groups. This finding supports previous research showing differences in parent feeding practices by race/ethnicity.[18,33,34] Future intervention research may need to culturally tailor interventions targeting parent feeding practices dependent on racial/ethnic group.

Results from the current study also indicated that there may be mealtime characteristics/contextual factors associated with parent feeding practices that are important to take into consideration when targeting parent feeding practices. For example, parents engaged in more restrictive feeding practices when: (1) combination meals were served that included components of homemade, pre-prepared, and/or fast foods; (2) more adults participated in the meal; (3) the partner/spouse made the meal; (4) the emotional atmosphere of the meal was tense or chaotic; and (5) the meal occurred scattered throughout the house. These mealtime contextual results are new findings for the field and suggest that mealtime characteristics (e.g., parents restrict when meal was tense or chaotic) could be targeted in real-time in future interventions using ecological momentary interventions (EMI) to decrease restriction and pressure-to-eat parent feeding practices. For example, if parents tend to restrict when the meal is scattered throughout the house, an EMI message could be sent to parents a few hours before the meal to remind parents that eating at the table promotes a good meal atmosphere.

Study results further indicated that certain foods are more likely to be restricted and/or pressured by parents. For example, parents were more likely to pressure meat proteins, fruits, and refined grains and restrict desserts, cakes and candy. Identifying these specific types of foods that are more prone to being pressured or restricted by parents may allow for more targeted intervening on parent feeding practices. Additionally, specific foods were more likely to be restricted or pressured depending on the race/ethnicity of the parent. For example, 32% of Native Americans pressured meat proteins which was statistically different from all other racial/ethnic groups. Some foods that were likely to be pressured or restricted by racially/ethnically diverse parents may seem counterintuitive (e.g., restricting vegetables). One hypothesis for restricting vegetables may be related to parents counting French fries as a vegetable (parents were not told to exclude French fries as a vegetable), and parents may be more likely to restrict French fries. Similarly, some culturally-specific vegetables (e.g., fried greens or fried okra in Black/African American families; fried yucca in Hispanic families) may not be healthy and parents may restrict them. It may also be the case that parents restrict vegetables because they cost more and they do not want their children wasting them. In addition, 42% of Hmong parents pressured refined grains. This is likely to be rice, which is a food that is highly valued in the Hmong culture. These results reinforce the idea that interventions targeting parent feeding practices may need to be culturally tailored to different racial/ethnic groups to have the most success.

There were both strengths and limitations of the current study. Strengths of the current study include the use of EMA to measure behaviors at multiple time points within and across days

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over an eight-day period. Additionally, the sample included racially/ethnically and socioeconomically diverse participants, as well as immigrant populations. There were also limitations of the current study, one includes the use of items from scales that have not been used with EMA or with immigrant populations, including one-item measures such as parent restriction and pressure-to-eat. When designing the EMA measures, participant burden and ability/skill to answer questions had to be balanced with obtaining more detailed information. Thus, the parent feeding practices measure had to be short in order for parents to fill out the survey multiple times per day. In addition, measures used to capture the foods served at meals were not asked in a complex way (e.g., fat, sugar, or sodium content) like a detailed dietary recall software program would do. For example, participants were not asked about the preparation techniques of the foods served at meals due to varying participant ability to correctly identify these methods. Therefore, less healthy preparation techniques (e.g., fried foods; French fries) could be included in a food category alongside more healthy preparation techniques (e.g., boiled foods; potatoes). Furthermore, the overall sample size of the study was relatively small (n=150) and may not be generalizable to the larger population however, the inclusion of individual meal occasions resulted in over one thousand data points. Given this is one of the first studies to examine parent feeding practices using momentary methods, it would be important to replicate these findings using larger samples.

CONCLUSION

Overall, parent feeding practices were variable across the week, indicating that they are more likely to be state-like (i.e., context dependent) than trait-like. In addition, there were some significant associations found between meal characteristics and the likelihood of engaging in restriction and pressure-to-eat feeding practices, such as tense/chaotic meal atmospheres and food types served at meals (e.g., homemade, fast food). Furthermore, some foods were more likely to be restricted or pressured across the week depending on parent race/ethnicity. Given that parent feeding practices appear to be more state-like, future interventions should consider utilizing ecological momentary interventions (EMI) to target, in real-time, predictors of parent feeding practices to decrease restriction and pressure-to-eat parent feeding practices. Additionally, interventions may want to educate parents about foods that are more likely to be restricted or pressured to reduce these behaviors. Providers that work with parents of young children may also want to provide anticipatory guidance to parents related to study findings showing parent feeding practices are more state-like and thus potentially modifiable. Furthermore, providers could educate parents regarding which meal characteristics promote restriction and pressure-to-eat parent feedings to minimize the influence of these contexts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Measures Used in the Analysis

Construct Measured	How Variable was Created for Analysis
Ecological momentary assessment (EMA)	Multiple daily EMA surveys were completed by parents over eight days. iPad minis were provided to parents to enter responses to the EMA surveys during the eight-day observation period. Standardized EMA data collection protocols from prior studies[8] were used in the study including: (1) signal contingent, (2) event contingent, and (3) end-of-day EMA recordings.[8] For the current analysis, only the event contingent recordings were used. Event contingent recordings were self-initiated by parents whenever they shared an eating occasion with the child. Parents were asked to fill out information about the type of food served at the meal, what the child actually ate, parent feeding practices used, child eating behaviors, meal atmosphere, food preparation and planning, and other meal logistics (e.g., who was at the meal, how long it lasted). To ensure that participants would fill out meal surveys throughout the day even if they forget to self-initiate an event (i.e., meal) contingent survey, there was a question at the beginning of each of the signal contingent surveys that asked the parent if they had eaten a meal recently with their child that they hadn't filled out a survey for yet (i.e., event contingent/meal survey). If they said yes, parents were routed to the meal survey (i.e., event contingent) first and then brought back the finish the signal contingent survey. All EMA responses were time-stamped, which allowed for understanding temporality of associations. Participants' were assigned additional days of EMA if several EMA prompts were missed within a day to obtain a minimum of eight full days of EMA data with at least four complete EMA responses per day (i.e., at least 2 signal contingent responses; at least 1 event contingent response; 1 end-of-day response).
Parent feeding practices	Parent restriction and pressure-to-eat parent feeding practices were measured during event contingent (i.e., meal occasions) EMA surveys using two items modeled after the Child Feeding Questionnaire.[23] Parent restriction (i.e., Did you have to make sure [child's name] didn't eat too much food at this meal?) and pressure-to-eat (i.e., Did you have to encourage [child's name] to eat more food at this meal?) feeding practices at meal occasions were measured as a dichotomous variable (0 – "No", 1 – "Yes"). All breakfast, lunch, dinner, and snacking meal occasions were included for analysis.
Foods served at meals	Specific foods served at meals were measured during event contingent (i.e., meal occasions) EMA surveys. Parents were asked which foods were served at the meal, based on a pre-existing measure of meal healthfulness.[24] Parents could select all the food categories that applied. Options included: fruit, vegetables, whole grains, refined grains, dairy, meat proteins, beans/eggs/seeds (labeled non-meat proteins), sugary drinks, cakes/cookies, or candy. Cakes/cookies and candy were combined into a single group. Presence or absence of the food at a meal was evaluated as a dichotomous variable.
Foods pressured or restricted	If parents endorsed pressuring or restricting their child during the meal, parents were asked in the same event contingent survey which specific foods served at the meal they pressured their child to eat (i.e., What food did you have to encourage [child's name] to eat more of?), or restricted their child from eating (i.e., What food did you have to make sure [child's name] didn't eat too much of?).
Meal characteristics	Characteristics of the meal occasion were measured during event contingent EMA surveys. Parents were asked about the children who attended the meal (i.e., target child, older/younger siblings, other family members, non-family members), the adults who attended the meal (i.e., primary parent, other caregiver, other family members, non-family members), and the number of children and adults present at the meal. Parents were also asked about who prepared the meal (i.e., self, partner, child, another adult in household, other person, food establishment), the type of foods served (i.e., fast food/take-out, pre-prepared foods (e.g., macaroni and cheese, frozen meals) or purchased snacks (e.g., chips, cereal), homemade/freshly prepared (including fresh fruits and vegetables), where the meal took place (i.e., around a table/counter, on couch in living room, scattered throughout house, standing up, in the car, at a restaurant), and the reason specific foods were served (i.e., too tired to cook, it was quick and easy, it was a planned meal, it was available at restaurant, it was a healthy option, desire to avoid conflict, child requested a specific food/meal, child/family likes, the food was available, stressful day/busy schedule). [20,25] Event contingent questions also asked about the emotional atmosphere of the meal (i.e, chaotic, rushed, tense, relaxed, enjoyable, neutral), and the activities engaged in during a meal (i.e., conversation, watching TV or TV on in background, playing a video game, using a cell phone, table or computer, reading/looking at a book, listening to headphones).

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Table 2

Comparison of Demographic Characteristics Between the Full Family Matters Sample (N=150) and the Sample with Variability in Parent Feeding Practices Across the Week—Within Parent (n=72 Restriction and n=100 Pressuring)

	Full Family Matters Sample (n=150)	Parent Restriction Analytic Sample (n=72)		Parent Pressure-to- Eat Analytic Sample (n=100)	
Parent Characteristics	**N (%)**	**N (%)**	**P Value***	**N (%)**	**P Value***
Female	137 (91%)	69 (96%)	0.082	92 (92%)	0.761
Age in years (sd)	34.5 (7.1)	34.0 (6.8)	0.363	34.7 (6.8)	0.618
Adult BMI	30.9 (7.2)	31.8 (7.5)	0.147	30.4 (7.2)	0.238
Weight Status					
Nonoverweight	35 (23%)	12 (17%)	0.183	27 (27%)	0.219
Overweight/Obese	115 (77%)	60 (83%)		73 (73%)	
Parent Race					
Asian	25 (17%)	12 (17%)		18 (18%)	
Black/African American	22 (15%)	8 (11%)		8 (8%)	
Hispanic	23 (15%)	15 (21%)		14 (14%)	
Native American	21 (14%)	11 (15%)	0.282	15 (15%)	0.060
Somali	25 (17%)	13 (18%)		17 (17%)	
White	27 (18%)	9 (13%)		22 (22%)	
Mixed/Other	7 (5%)	4 (6%)		6 (6%)	
Household Income					
Less than $20,000	50 (33%)	29 (40%)	0.193	33 (33%)	0.244
$20,000 – $34,999	55 (37%)	21 (29%)		34 (34%)	
$35,000 – $49,999	16 (11%)	8 (11%)		13 (13%)	
$50,000 – $74,999	12 (8%)	7 (10%)		7 (7%)	
$75,000 – $99,999	7 (5%)	4 (6%)		7 (7%)	
$100,000 or more	9 (6%)	2 (3%)		5 (5%)	
Missing	1 (1%)	1 (1%)		1 (1%)	

*Note: The statistical test indicates if parents in the analytic sample were overall different on the sample characteristic from those who were not in the analytic sample.

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Table 3

Probability of Engaging in Specific Feeding Practices Based on the Day of the Week and Race Group[*†]

	Day of Week							
Feeding Practice	**Sunday**	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Overall *P* Value**
Restriction	0.12 (0.09, 0.16)a	0.11 (0.08, 0.16)a	0.12 (0.09, 0.17)a	0.11 (0.08, 0.15)a	0.13 (0.1, 0.18)a	0.12 (0.08, 0.16)a	0.13 (0.1, 0.18)a	0.785
Pressure-to-eat	0.12 (0.09, 0.16)a	0.16 (0.12, 0.21)ab	0.16 (0.12, 0.2)ab	0.18 (0.15, 0.23)b	0.18 (0.14, 0.23)b	0.16 (0.12, 0.2)ab	0.15 (0.11,0.19)ab	**0.032**
	Race Group							
Feeding Practice	**Black/African American**	**White**	**Hmong**	**Hispanic**	**Native American**	**Somali**	**Overall *P* Value**	
Restriction	0.07 (0.01, 0.12)a	0.06 (0.01, 0.12)a	0.15 (0.06, 0.24)a	0.15 (0.07, 0.23)a	0.12 (0.05, 0.20)a	0.16 (0.07, 0.24)a	0.262	
Pressure-to-eat	0.04 (0.02, 0.08)a	0.21 (0.13, 0.3)cd	0.32 (0.22, 0.43)d	0.09 (0.05, 0.16)ab	0.13 (0.08, 0.21)bc	0.15 (0.09, 0.23)bc	**<0.001**	

[*] Models adjusted for: parent sex and age, child sex and age, household race, child weight status, parent weight status, and household income

[†] Pairwise comparisons that share a letter are not signiicantly different at p <0.05

Interpretation Example: Pressuring was different across race groups (P<0.001). African American parents were least likely to use pressuring (0.04, 95% CI: 0.02, 0.08), and Hmong parents had the highest likelihood of pressuring (0.32, 95% CI: 0.22, 0.43). Hispanic, Native American, and Somali parents had similar likelihood of pressuring (P>0.05).

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Table 4

Parent Feeding Practice Variability at All Meals (n=3,878 meal occasions), Breakfasts (n=956 meals), Lunches (n=596 meals), and Dinners (n=1,206 meals) in the Total Sample, Between-, and Within- Parents (N=150 parents)

All Meals*	**Overall**		**Between-Parent**		**Within-Parent**
Feeding Practice	**Meal Frequency**	**Percent**	**Meal Frequency**	**Percent**	**Percent**
Restriction					
Absent	3385	87.3%	148	98.7%	90.4%
Present	493	12.7%	74	49.3%	22.0%
Total	3878	100%			
Pressuring					
Absent	3313	85.4%	147	98.0%	88.0%
Present	565	14.6%	103	68.7%	20.1%
Total	3878	100%			
Parents with Variability in Feeding Practice	n (%)	Fraction also with Variability in *Pressure*			
Restriction	72 (48.0%)	86%			
		Fraction also with Variability in *Restrict*			
Pressuring	100 (66.7%)		62%		
Breakfast Only	**Overall**		**Between-Parent**		**Within-Parent**
Feeding Practice	Frequency	Percent	Frequency	Percent	Percent
Restriction					
Absent	838	87.7%	134	96.4%	92.9%
Present	118	12.3%	38	27.3%	38.1%
Total	956	100%			
Pressuring					
Absent	809	84.6%	132	95.0%	90.8%
Present	147	15.4%	50	36.0%	38.4%
Total	956	100%			
Lunch Only	**Overall**		**Between-Parent**		**Within-Parent**
Feeding Practice	Frequency	Percent	Frequency	Percent	Percent

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All Meals*	Overall		Between-Parent		Within-Parent
Feeding Practice	**Meal Frequency**	**Percent**	**Meal Frequency**	**Percent**	**Percent**
Restriction					
Absent	507	85.1%	139	95.9%	94.9%
Present	89	14.9%	26	17.9%	50.3%
Total	596	100%			
Pressuring					
Absent	491	82.4%	136	93.8%	89.7%
Present	105	17.6%	45	31.0%	51.2%
Total	596	100%			
Dinner Only	**Overall**		**Between-Parent**		**Within-Parent**
Feeding Practice	Frequency	Percent	Frequency	Percent	Percent
Restriction					
Absent	1065	88.3%	146	98.0%	91.0%
Present	141	11.7%	43	28.9%	37.5%
Total	1206	100%			
Pressuring					
Absent	989	82.0%	144	96.6%	85.3%
Present	217	18.0%	76	51.0%	34.5%
Total	1206	100%			

*Note: The frequency of feeding practices is presented for all meal occasions (“Overall”), between parents to describe how common feeding practices were used or not used by the parent participants (“Between-Parent”), and within-parent meal occasions to characterize how often parents utilize various feeding practices at their observed meals (“Within-Parent” meal occasions).

Interpretation Example: Parents who used restrictive feeding practices at least once, did so at 22% of their meals, and those who used pressuring at least once, did so at 20.1% of their meals.

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Table 5

Associations Between Meal Characteristic and Parent Restriction and Food Pressuring at Meal Occasions (n=3,878 meal occasions including snacks)[*,†]

	Outcome: Restriction		Outcome: Pressuring	
	Predicted Probability		Predicted Probability	
Meal Characteristic Predictor	**(95% CI)**	***P* Value**	**(95% CI)**	***P* Value**
Meal Type				
Homemade	0.10 (0.08, 0.14)a	**<0.001**	0.19 (0.16, 0.23)b	**<0.001**
Pre-Prepared	0.12 (0.09, 0.16)ab		0.11 (0.08, 0.15)a	
Pre-Prepared + Homemade	0.12 (0.08, 0.17)ab		0.16 (0.11, 0.22)ab	
Fast Food	0.15 (0.11, 0.20)b		0.11 (0.08, 0.16)a	
Fast Food + Homemade	0.34 (0.21, 0.49)d		0.43 (0.28, 0.60)c	
Fast-Food + Pre-Prepared	0.13 (0.03, 0.38)abc		0.05 (0.00, 0.51)ab	
Fast Food+ Pre-Prepared + Homemade	0.35 (0.19, 0.56)cd		0.21 (0.10, 0.4)ab	
Number of Children Present				
Target child	0.13 (0.09, 0.18)ab	0.880	0.12 (0.09, 0.17)a	0.363
Two children	0.11 (0.08, 0.14)a		0.16 (0.13, 0.20)b	
Three children	0.11 (0.08, 0.16)ab		0.16 (0.12, 0.21)ab	
Four children or more	0.14 (0.10, 0.19)b		0.17 (0.13, 0.21)b	
Composition of Children Attending the Meal				
Only child present	0.13 (0.09, 0.18)a	0.696	0.12 (0.09, 0.16)a	0.054
Child and siblings	0.12 (0.09, 0.15)a		0.17 (0.14, 0.21)b	
Child, siblings, and other kids	0.13 (0.09, 0.18)a		0.12 (0.08, 0.16)a	
Number of Adults Attending the Meal				
Parent	0.11 (0.09, 0.15)a	**0.033**	0.14 (0.11, 0.18)a	0.298
Parent + another adult	0.11 (0.08, 0.15)a		0.17 (0.14, 0.22)b	
Parent + 2 or more adults	0.16 (0.12, 0.21)b		0.16 (0.12, 0.21)ab	
Composition of Adults Attending the Meal				
Parent	0.11 (0.09, 0.15)a	0.148	0.14 (0.11, 0.18)a	0.266
Parent and caregiver	0.12 (0.09, 0.16)a		0.16 (0.13, 0.20)ab	
Parent, adult family, and non-family adults	0.13 (0.09, 0.17)a		0.18 (0.14, 0.23)b	
Who Prepared the Meal				
Parent	0.11 (0.08, 0.15)a	**0.048**	0.16 (0.13, 0.20)a	0.144
Partner (e.g. spouse)	0.16 (0.11, 0.23)b		0.15 (0.11, 0.21)a	
Child participant only	0.10 (0.06, 0.16)ab		0.07 (0.04, 0.13)b	
Child participant + parent/partner	0.12 (0.07, 0.18)ab		0.15 (0.09, 0.22)a	
Other source (e.g., fast food, restaurant, another adult)	0.13 (0.10, 0.17)ab		0.17 (0.13, 0.21)a	
Meal Setting				
Around a table or counter at home	0.12 (0.09, 0.16)ab	**0.022**	0.17 (0.14, 0.21)b	**0.006**
On couch/chair in living area at home	0.10 (0.07, 0.15)a		0.14 (0.10, 0.18)a	

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	Outcome: Restriction		Outcome: Pressuring	
	Predicted Probability		**Predicted Probability**	
Meal Characteristic Predictor	**(95% CI)**	***P* Value**	**(95% CI)**	***P* Value**
Scattered throughout house or standing up	0.16 (0.11, 0.22)b		0.13 (0.09, 0.19)ab	
Out of home (e.g. in the car, restaurant, other)	0.11 (0.07, 0.16)ab		0.11 (0.07, 0.16)a	
What Influenced Decisions to Prepare the Meal				
Child/family likes or requested	0.11 (0.08, 0.15)b	0.053	0.13 (0.10, 0.17)ab	**0.003**
Desire to avoid conflict with child or a family fight	0.06 (0.02, 0.13)a		0.14 (0.07, 0.24)abcd	
It was a healthy option	0.16 (0.12, 0.22)c		0.17 (0.13, 0.23)bcd	
It was a planned meal	0.10 (0.06, 0.14)ab		0.18 (0.14, 0.24)cd	
Available where we ate (e.g., home or restaurant)	0.13 (0.10, 0.18)bc		0.22 (0.17, 0.27)d	
Quick and easy to make	0.13 (0.09, 0.18)abc		0.16 (0.12, 0.21)a	
Stressful day, busy schedule, or too tired to cook	0.13 (0.08, 0.21)bc		0.16 (0.11, 0.24)bc	
Other	0.13 (0.07, 0.24)bc		0.09 (0.04, 0.18)abcd	
Activity During the Meal				
Conversation only	0.11 (0.08, 0.15)a	0.123	0.16 (0.13, 0.20)a	0.503
Screentime and other distractions	0.13 (0.09, 0.18)a		0.17 (0.12, 0.22)a	
Combination and other distractions	0.13 (0.10, 0.18)a		0.16 (0.12, 0.20)a	
None of the above	0.13 (0.09, 0.19)a		0.13 (0.09, 0.19)a	
Overall Atmosphere of the Meal				
Relaxed	0.11 (0.08, 0.15)a	**0.015**	0.13 (0.10, 0.17)a	0.496
Neutral	0.10 (0.06, 0.14)a		0.21 (0.16, 0.27)b	
Enjoyable	0.13 (0.10, 0.17)ab		0.15 (0.12, 0.19)a	
Tense	0.15 (0.08, 0.26)ab		0.16 (0.09, 0.27)ab	
Chaotic	0.17 (0.12, 0.25)b		0.16 (0.10, 0.24)ab	
Rushed	0.11 (0.06, 0.19)ab		0.15 (0.10, 0.24)ab	

*Models adjusted for: parent sex and age, child sex and age, household race, child weight status, parent weight status, and household income

†Pairwise comparisons that share a letter are not signiicantly different at p <0.05

Interpretation Example: Meal type (i.e., homemade, fast food, and preprepared) was statistically predictive of restriction at the meal (P<0.001). The probability of parent restriction was highest when fast food was combined with homemade and pre-prepared meals (0.35, 95% CI: (0.19, 0.56)) and lowest when the meal contained only homemade food (0.10, 95% CI: 0.08, 0.14).

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Table 6

Probability of Parent Restriction (n=493 meal occasions) and Pressuring (n=565 meal occasions) of Specific Foods at Meal Occasions by Race Group

	Outcome: Non-meat Protein (e.g., beans, peanut butter)		Outcome: Cake, Desserts or Candy		Outcome: Dairy		Outcome: Fruits		Outcome: Meat Protein		Outcome: Refined Grains		Outcome: SSB		Outcome: Vegetables		Outcome: Whole Grains	
Independent Predictor	**Predicted Probability**	**P Value**	**Predicted Probability**	**P Value**	**Predicted Probability**	**P Value**	**Predicted Probability**	**P Value**	**Predicted Probability**	**P Value**	**Predicted Probability**	**P Value**	**Predicted Probability**	**P Value**	**Predicted Probability**	**P Value**	**Predicted Probability**	**P Value**
Restricted Food (Overall Probability)	0.05 (0.03, 0.07)		0.21 (0.16, 0.28)		0.18 (0.13, 0.24)		0.14 (0.12, 0.17)		0.17 (0.14, 0.20)		0.14 (0.11, 0.19)		0.14 (0.11, 0.19)		0.22 (0.16, 0.29)		0.19 (0.13, 0.26)	
Black/African American	0.02 (0.00, 0.11)a	0.682	0.36 (0.17, 0.60)b	0.163	0.21 (0.07, 0.47)ab	0.179	0.06 (0.02, 0.15)a	0.095	**0.16 (0.10, 0.26)bc**	**<0.001**	0.05 (0.01, 0.16)ab	0.156	0.05 (0.02, 0.14)ab	0.051	**0.06 (0.01, 0.22)a**	**0.004**	0.17 (0.04, 0.47)a	0.103
White	0.09 (0.01, 0.42)a		0.29 (0.11, 0.57)ab		--		0.07 (0.01, 0.36)ab		**0.07 (0.01, 0.31)ab**		0.28 (0.10, 0.56)bc		--		--		0.54 (0.26, 0.80)b	
Hmong	0.05 (0.03, 0.10)a		0.23 (0.12, 0.41)b		0.15 (0.07, 0.29)ab		0.25 (0.20, 0.30)c		**0.21 (0.15, 0.28)cd**		0.28 (0.18, 0.40)c		0.18 (0.13, 0.24)c		**0.27 (0.14, 0.44)bc**		0.10 (0.03, 0.24)a	
Hispanic	0.05 (0.02, 0.13)a		0.22 (0.12, 0.37)b		0.20 (0.10, 0.36)ab		0.05 (0.02, 0.13)a		**0.13 (0.07, 0.23)abc**		0.13 (0.07, 0.25)b		0.20 (0.13, 0.30)c		**0.03 (0.01, 0.13)a**		0.18 (0.08, 0.35)a	
Native American	0.09 (0.04, 0.17)a		0.22 (0.10, 0.41)ab		0.32 (0.17, 0.52)b		0.18 (0.11, 0.28)bc		**0.32 (0.22, 0.43)d**		0.11 (0.05, 0.23)b		0.10 (0.05, 0.19)bc		**0.12 (0.05, 0.28)ab**		0.27 (0.13, 0.48)ab	
Somali	0.03 (0.01, 0.08)a		0.07 (0.03, 0.16)ab		0.09 (0.04, 0.21)a		0.10 (0.06, 0.17)ab		**0.05 (0.02, 0.11)a**		0.02 (0.00, 0.08)a		0.02 (0.00, 0.07)ab		**0.43 (0.26, 0.62)c**		0.24 (0.12, 0.42)ab	
Food Pressuring (Overall Probability)	0.14 (0.10, 0.19)		0.07 (0.04, 0.12)		0.18 (0.13, 0.25)		0.24 (0.19, 0.31)		0.34 (0.29, 0.40)		0.24 (0.21, 0.27)		--		0.45 (0.39, 0.51)		0.18 (0.13, 0.24)	
Black/African American	0.17 (0.04, 0.48)a	0.616	0.05 (0.01, 0.35)ab	0.449	0.05 (0.01, 0.33)a	0.695	**0.21 (0.07, 0.48)ab**	**0.003**	**0.57 (0.32, 0.78)b**	**<0.001**	**0.11 (0.03, 0.35)a**	**<0.001**	--		0.33 (0.14, 0.59)ab	0.232	0.17 (0.05, 0.45)a	0.787
White	0.13 (0.06, 0.24)a		0.02 (0.00, 0.12)a		0.16 (0.08, 0.28)ab		**0.07 (0.03, 0.16)a**		**0.38 (0.28, 0.49)b**		**0.11 (0.06, 0.18)a**		--		0.40 (0.30, 0.52)ab		0.21 (0.12, 0.33)a	
Hmong	0.13 (0.07, 0.24)a		0.07 (0.02, 0.19)ab		0.22 (0.13, 0.35)b		**0.34 (0.24, 0.46)b**		**0.40 (0.30, 0.51)b**		**0.42 (0.37, 0.48)b**		--		0.51 (0.41, 0.62)b		0.18 (0.10, 0.30)a	
Hispanic	0.06 (0.02, 0.21)a		0.02 (0.00, 0.17)ab		0.09 (0.03, 0.25)ab		**0.10 (0.03, 0.25)a**		**0.30 (0.17, 0.46)ab**		**0.05 (0.01, 0.18)a**		--		0.41 (0.26, 0.57)ab		0.25 (0.13, 0.43)a	
Native American	0.19 (0.08, 0.37)a		0.02 (0.00, 0.12)a		0.18 (0.08, 0.35)ab		**0.20 (0.10, 0.37)ab**		**0.36 (0.24, 0.51)b**		**0.15 (0.09, 0.26)a**		--		0.51 (0.37, 0.65)b		0.21 (0.11, 0.37)a	
Somali	0.15 (0.07, 0.29)a		0.14 (0.06, 0.29)b		0.17 (0.08, 0.33)ab		**0.27 (0.17, 0.41)b**		**0.13 (0.07, 0.23)a**		**0.08 (0.04, 0.15)a**		--		0.32 (0.21, 0.45)a		0.11 (0.05, 0.23)a	

Models adjusted for: parent sex and age, child sex and age, household race, child weight status, parent weight status, and household income

†Pairwise comparisons that share a letter are not signiicantly different at p <0.05

Interpretation Example: Meat protein (0.34, 95% CI: 0.29, 0.40) had a high probability of being pressured, and the probabilities differed between race/ethnic groups (P<0.01 or less). For example, pairwise comparisons indicate that African Americans had the highest likelihood of pressuring meat protein (0.57, 95% CI: 0.32, 0.78) which was statistically different (P<0.05) from Somali parents (0.13, 95% CI: 0.07, 0.23). The White, Hmong, and Native American parents were also statistically higher than Somali parents on meat pressuring (P<0.05).