

Childhood Obesity and Interpersonal Dynamics During Family Meals

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KEY WORDS

family meals, direct observation, family dynamics, childhood obesity

ABBREVIATIONS

IFIRS—Iowa Family Interaction Rating Scales

SES—socioeconomic status

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WHAT'S KNOWN ON THIS SUBJECT: Family meals are protective for child health, but there are inconsistent findings in relation to child weight status. More research is needed examining why family meals are protective for child health and whether there are differences by child weight status.



WHAT THIS STUDY ADDS: The current mixed-methods study used direct observational methods to examine family dynamics during family meals and child weight status. Results indicated that positive family interpersonal and food-related dynamics during family meals were associated with reduced prevalence of childhood obesity.

abstract



BACKGROUND: Family meals have been found to be associated with a number of health benefits for children; however, associations with obesity have been less consistent, which raises questions about the specific characteristics of family meals that may be protective against childhood obesity. The current study examined associations between interpersonal and food-related family dynamics at family meals and childhood obesity status.

METHODS: The current mixed-methods, cross-sectional study included 120 children (47% girls; mean age: 9 years) and parents (92% women; mean age: 35 years) from low-income and minority communities. Families participated in an 8-day direct observational study in which family meals were video-recorded in their homes. Family meal characteristics (eg, length of the meal, types of foods served) were described and associations between dyadic (eg, parent-child, child-sibling) and family-level interpersonal and food-related dynamics (eg, communication, affect management, parental food control) during family meals and child weight status were examined.

RESULTS: Significant associations were found between positive family- and parent-level interpersonal dynamics (ie, warmth, group enjoyment, parental positive reinforcement) at family meals and reduced risk of childhood overweight. In addition, significant associations were found between positive family- and parent-level food-related dynamics (ie, food warmth, food communication, parental food positive reinforcement) and reduced risk of childhood obesity.

CONCLUSIONS: Results extend previous findings on family meals by providing a better understanding of interpersonal and food-related family dynamics at family meals by childhood weight status. Findings suggest the importance of working with families to improve the dyadic and family-level interpersonal and food-related dynamics at family meals. *Pediatrics* 2014;134:923–932

Cross-sectional and longitudinal research over the past decade has consistently shown that having frequent family meals is associated with a number of health benefits for children (ie, increased fruit and vegetable intake,¹⁻³ lower levels of extreme weight-control behaviors,⁴ better psychosocial health⁵). These protective associations in children have been found across genders, races/ethnicities, and socioeconomic status (SES).¹⁻³ Furthermore, some studies have shown significant associations between the frequency of family meals and reduced risk of childhood obesity, although findings have been inconsistent across studies.⁶⁻⁸ Looking in-depth at characteristics of family meals may help identify key protective factors related to family meals. For example, examining dyadic (eg, parent-child, child-sibling) and family-level interpersonal and food-related dynamics at family meals, such as communication, group enjoyment, parental food intrusiveness, and characteristics of family meals, such as who is present at the meal, number of distractions (eg, electronics, leaving the table), or length of the meal, may give a more comprehensive understanding of the characteristics of family meals that increase their protective nature.

In addition, given the high prevalence of childhood obesity,⁹⁻¹² it is important to know whether significant differences in family meals exist between households with children who are overweight/obese and children who are nonoverweight. Examining interpersonal and food-related dynamics between family members during family meals may lead to identifying modifiable factors in the home that could inform childhood obesity intervention development aimed at increasing the frequency of family meals and improving the emotional quality of meals, as well as inform recommendations for providers working with families with school-aged children.

There has been limited previous research examining family dynamics during family meals. Two cross-sectional direct observational studies examined family functioning during family meals with children who are overweight and found that families with an overweight/obese child had difficulties with managing family conflict and task accomplishment during family meals compared with families with nonoverweight children.^{13,14} Findings from a pilot study, which led to the current study, suggested that more positive interpersonal interactions among family members during family meals were associated with lower BMI percentile and more healthful dietary intake in adolescents.¹⁵ Thus, limited results suggest that family dynamics during family meals may be associated with youth weight and weight-related behaviors; however, these studies were conducted in small samples, were not racially/ethnically or socioeconomically (SES) diverse, and included older children and adolescents.

In addition, although these previous studies measured family functioning, they did not examine dyadic and family-level food-related dynamics (eg, food hostility, food communication, parental food intrusiveness), which may provide a more in-depth look at multiple family members' behaviors at family meals, including behaviors specifically related to eating. Furthermore, previous direct observational research on family meals has not examined associations by child weight status, which may provide insight into interpersonal and food-related risk and protective factors for childhood obesity at family meals.¹³⁻¹⁵

The current study builds on and expands the previous literature on family meals by using direct observational methods in a diverse sample of children to address the following research questions:

1. What are common characteristics of family meals (eg, length of meal,

electronics used at meal, television viewing at meal, people present at meal) among school-aged children and across child weight status of school-aged children?

2. What types of dyadic and family-level interpersonal (eg, communication, relationship quality, behavioral control, enjoyment) and food-related (eg, parental food control, food intrusiveness, food permissiveness) dynamics occur during family meals?

3. Is there an association between dyadic and family-level interpersonal and food-related dynamics during family meals and childhood weight status?

The main hypothesis of the study, based on tenets from Family Systems Theory,^{16,17} is that families with more positive interpersonal (ie, parent-child, child-sibling) and food-related dynamics during family meals will have children who are less likely to be overweight/obese.

METHODS

Sample and Study Design

The Family Meals LIVE! study is a 2-year, mixed-methods, cross-sectional study designed to identify key risk and protective factors for childhood obesity in the home food environment. Family Meals LIVE! was guided by Family Systems Theory, which recognizes multiple levels of familial influences (ie, parent, sibling, family-level) on a child's eating behaviors.¹⁶⁻¹⁸ Direct observational data were collected including the following: video-recordings on iPads (Apple, Cupertino, CA) of family meals, qualitative interviews, three 24-hour dietary recalls on the target child with primary caregiver assistance, and a home food inventory. In addition, surveys were conducted with 1 parent and the target child. All participating family members consented or assented their participation in the study. All study protocols

were approved by the University of Minnesota's Institutional Review Board. Children ($N = 120$) and their families from 4 primary care clinics serving primarily diverse and low-income families in Minneapolis/St Paul participated in Family Meals, LIVE! in 2012–2013. A recruitment letter from the primary care doctor was sent to the child's primary caregiver inviting participation in the Family Meals LIVE! study. Children and their families were eligible to participate if the child was between the ages of 6 and 12 years old, family members spoke and read English, and if the family ate at least 3 family dinners per week (to ensure that we would be recruiting families who "normally" ate family meals together). On the basis of previous literature suggesting inconsistencies in the protective nature of family meals by weight status, we stratified recruitment by weight status ($>5^{\text{th}}$ and $<85^{\text{th}}$ BMI percentile = nonoverweight; $\geq 85^{\text{th}}$ BMI percentile = overweight/obese) to learn how family meals may function differently in these households.^{6,19}

Of the 120 participants, 53% were boys and 47% were girls, with an average age of 9 years (SD: 3.3 years; range: 6–12 years) (see Table 1). The majority of parents/guardians were mothers or other female guardians (90%) and were ~35 years old (SD: 7.5 years; range: 25–65 years). The racial/ethnic backgrounds of the participating children were as follows: 74% African American, 18% white, 9% American Indian, 6% Asian, and 3% mixed or other race/ethnicity; parents were similarly diverse. More than 50% of the children were from very low SES households ($< \$20\,000$). The majority of parents had finished high school but had not attended college, and ~50% of parents were working full or part time.

Procedures

Families participated in 2 home visits (Fig 1). During the first home visit,

families were asked to record 8 consecutive days of family dinner meals to capture both weekdays and weekends. They were told to eat as they normally do, including moving to locations within the house where they typically eat their meals (eg, family room). In addition, families were told that the main aim of the study was to learn more about what a "modern day" family meal looked like and that there was no "right" or "wrong" way to have a family meal.

The majority of families ($n = 118$) completed all aspects of data collection; only 2 families had difficulties with video-recording all meals, due to the target child being unavailable for 3 meals, and recorded 5 meals (3 weekdays and 2 weekends). In addition, in a few families ($n = 12$), there were some observational days skipped due to other events (eg, Tuesday night one family had a child's band concert and didn't record a meal). In these specific situations, the family's observation period was extended to obtain the full 8 days of observation.

Coding of Video-Recorded Data

Six research team members who were blinded to the study hypotheses were extensively trained on the Iowa Family Interaction Rating Scales²⁰ (IFIRS; Table 2) coding system used to code the dyadic and family-level interpersonal and food-related dynamics at family meals. Practice video-recordings were used until coders reached 95% reliability with a gold standard and then 95% interrater reliability among coders. Coding was completed for up to 6 dyads present at the family meal (ie, mom–target child, mom–sibling, secondary caregiver–target child, secondary caregiver–sibling, sibling–sibling, mom–secondary caregiver) and for the overall family group. Consistent with the IFIRS coding protocol, the family meal recording was watched and coded separately for each dyad at the family meal. In a few families ($n = 5$), parents would get the meal started for

TABLE 1 Demographic Characteristics of Parents and Children in Family Meals, LIVE!

	Value
Parent	
Gender, % (<i>n</i>)	
Female	92 (110)
Male	8.3 (10)
Race, % (<i>n</i>)	
American Indian/Alaskan Native	5 (6)
Asian	5 (6)
Black or African American	65 (78)
White	23 (28)
Mixed/other	4 (5)
Age, mean \pm SD, y	34.8 \pm 7.5
BMI, % (<i>n</i>)	
Obese (≥ 30)	40 (48)
Overweight (25 to < 30)	22 (26)
Nonoverweight (< 25)	38 (45)
Overweight, % (<i>n</i>)	
Yes (≥ 25)	82 (98)
No (< 25)	18 (21)
SES, % (<i>n</i>)	
Low ($< \$20\,000$)	52 (62)
Low-middle ($\$20\,000$ to $< \$35\,000$)	21 (25)
Middle ($\$35\,000$ to $< \$50\,000$)	11 (13)
Upper middle ($\$50\,000$ to $< \$75\,000$)	10 (12)
High ($\geq \$75\,000$)	6 (7)
Missing	1 (1)
Parent education, % (<i>n</i>)	
Less than high school	9 (11)
High school or GED	41 (49)
Vocational, technical, or trade	24 (28)
Any college	24 (29)
Other/missing	3 (3)
Work, % (<i>n</i>)	
Full time	31 (37)
Part time	18 (21)
Home caregiver	15 (18)
Unemployed, but looking	16 (19)
Not working for pay	20 (24)
Missing	1 (1)
Target child	
Gender, % (<i>n</i>)	
Female	47 (56)
Male	53 (64)
Race, % (<i>n</i>)	
American Indian/Alaskan Native	9 (11)
Asian	6 (7)
Black or African American	74 (89)
White	18 (22)
Mixed/other	3 (3)
Age, mean \pm SD, y	8.9 \pm 3.3
BMI, % (<i>n</i>)	
Obese ($\geq 95^{\text{th}}$ %ile)	30 (36)
Overweight (85th %ile to $< 95^{\text{th}}$ %ile)	20 (24)
Nonoverweight (5th %ile to $< 85^{\text{th}}$ %ile)	50 (60)
Overweight, % (<i>n</i>)	
Yes ($\geq 85^{\text{th}}$)	50 (60)
No ($< 85^{\text{th}}$)	50 (60)

GED, general educational development.

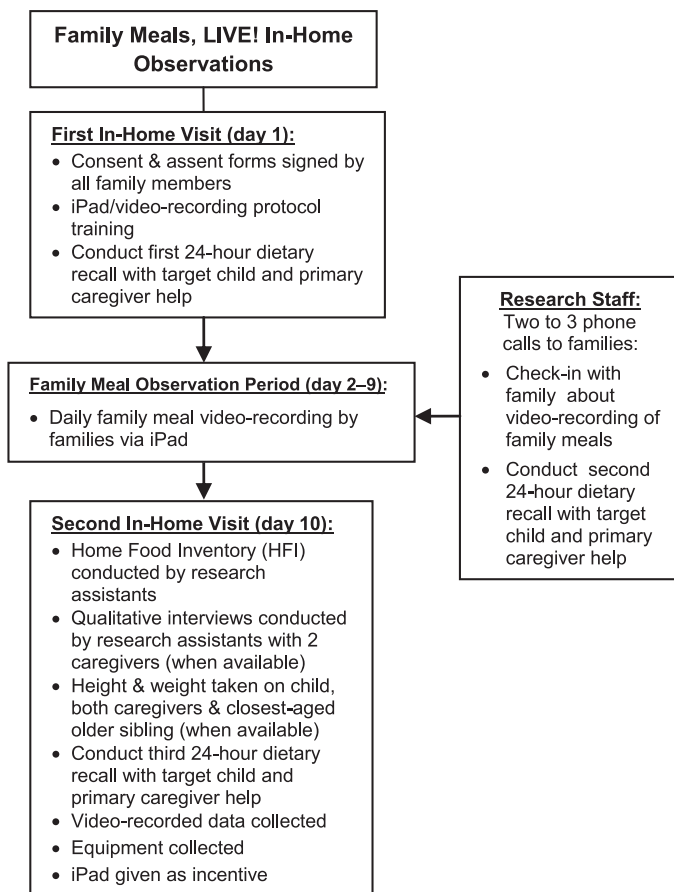


FIGURE 1
In-home observation protocol for Family Meals, LIVE!

the children and then eat their own meal in the adjoining family room (usually because there was not room at the table). In these situations the parent was still able to be seen, either on the far side of the video screen and/or when they went back and forth to check on the child(ren) eating dinner. Thus, we were still able to code interactions between parents, children, and siblings.

On the basis of direct observational literature showing that it is important to allow participants a “sensitizing period” to give them time to acclimate and become less reactive to the observation (ie, engage in more representative behavior), the first day of the 8-day family meal video-recordings was excluded.²¹

Measures

All IFIRS interpersonal family dynamics variables coded are listed in Table 2.

IFIRS variables that represented positive family functioning included the following: group enjoyment, relationship quality, warmth, communication, parental influence, and positive reinforcement. IFIRS variables that represented negative family functioning included hostility, lecture/moralize, silent/pause, indulgent/permissive, inconsistent discipline, and intrusiveness/control. The interpersonal and food-related family dynamics scores were derived from the dyadic-level scores according to the following formula: percentage of dyad-level relationship scores from each meal with scores greater than or equal to the midpoint score (≥ 5 on a scale of 1 to 9). For example, in a 3-person family meal consisting of a mother and 2 children, there are 3 dyads and 6 dyad-level score assessments (1 assessment in each direction). If the mother is coded

with a warmth score of 8 toward each child, 1 child is coded as a 6 toward the mother, and all other warmth scores are < 5 , then their family-level measure of warmth is 50% (3 of 6 scores ≥ 5). This scoring scale allows for creating a family-level variable that accounts equally for each family member’s contribution to the overall interpersonal atmosphere, while giving equal weight to families with differing numbers of family members present. IFIRS responses from 1 weekday (Wednesday) and 1 weekend day (Saturday) were averaged for each family to obtain a more complete picture of an average meal experience across 1 week.

Outcome Variable: Child Weight Status

All anthropometric measurements were completed following standardized procedures.²² Height was assessed to the nearest 0.1 cm by using a stadiometer and weight to the nearest 0.1 kg by using a calibrated scale. To ensure interrater reliability, both measures were taken twice, and agreement of < 1 cm for height and 0.5 kg for weight was required. BMI percentiles were calculated with the use of Centers for Disease Control and Prevention guidelines.²³

Covariates

Childrens’ and parents’ race/ethnicity and age were assessed by self-report. Race/ethnicity was assessed with the item “Do you think of yourself as 1) white, 2) black or African-American, 3) Hispanic or Latino, 4) Asian-American, 5) Hawaiian or Pacific Islander, or 6) American Indian or Native American?,” and respondents were asked to check all that applied. Participants who checked 2 race options were included in the “mixed/other” category. Parent and child age was calculated by using self-reported birth date and survey completion date.

TABLE 2 Definition and Coding Range of Interpersonal and Food-Related Codes in the IFIRS

Variable	Definition	Example of High Score (6–9)		Percentage (SE) ^a	
		Example of Low Score (1–4)	Example of High Score (6–9)	Nonoverweight (n = 60)	Overweight (n = 60)
Interpersonal and food-related family-level dynamics					
Group enjoyment	Degree of enjoyment, pleasure, fun, and satisfaction among all family members at the meal	Enjoyment, fun, or pleasure is not observed during the meal	Enjoyment is apparent, such as laughing and smiling occurs frequently	5.44 (0.3) ^b	4.10 (0.3) ^b
Relationship quality	Quality of the relationship between 2 people at the meal	Characterized as unhappy, conflicted, brittle, or uninvolved	Open, satisfying, pleasing, communicative, and/or warm; family members appear to enjoy each other's company	70 (5)	43 (6)
Hostility	Degree of hostile, angry, critical, disapproving and/or rejecting behavior toward another	Mild criticism, occasional abrupt remark, a scowl or frown, a cynical smile or tease	High degree of shouting, angry tones of voice, heavy use of sarcasm, frequent criticism or mocking	12 (2)	27 (4)
Food hostility	Food/mealtime specific hostility	Limited food related hostility is observed during the meal	Statements such as "I am not eating this gross food" or "You're such a pig!"	1.1 (1)	11 (3)
Lecture/moralize	Degree of lecturing, preachy, intrusive, pushy and/or moralizing behavior toward another	Brief, infrequent, and low-intensity lectures	Extended and unrelenting lectures that inhibit 2-way communication	1.6 (1)	3.3 (1)
Food lecture/moralize	Food/mealtime specific lectures or moralizing toward another	No food-related lectures or moralizing are observed during the meal	Statements such as "Children in other countries are starving while you waste food"	0.1 (0)	2 (1)
Warmth/nurture	Degree of expressing liking, appreciation, praise, care, concern, or support for another	No examples of warmth or support are observed during the meal	Offers a high degree of encouragement and praise, high degree of affectionate touching, warm smile, and/or positive comment	18 (6)	2.2 (2)
Food warmth/nurture	Food/mealtime specific warmth or nurturing for another	No food warmth is observed during the meal	Statements such as "Thanks, this is yummy" and "You eat really healthy"	5 (3)	ID
Communication	Extent of neutral or positive expression of needs and wants, rules and regulations, as well as clearly expresses information and ideas that may be useful to another	Communication skills are almost entirely absent; rarely or never uses reasoning, explanations, and clarification to make himself/herself understood	Frequently uses appropriate reasoning, explanations, and clarifications to make him/herself understood	40 (6)	27 (6)
Food communication	Communication that is specific to food or the child's behavior regarding food	Low levels of communication about food is observed during the meal, such as "pass the salt and pepper"	Statements such as "Why do you think we should eat healthy?" or "How do you think these grapes were grown?"	9.8 (4)	1.9 (1)
Silence/pause	Extent of tense or uncomfortable gaps and pauses in the ongoing conversations between 2 people	Rare to no tense gaps and pauses	Frequent and highly intense gaps and pauses	0.2 (0)	2.2 (2)
Interpersonal and food-related parent-level dynamics					
Parental influence/limit setting	Parent's attempts to socialize the child	Parent rarely attempts to regulate, control, or influence the child's behavior	Parent consistently attempts to control and regulate the child's behavior; frequently setting standards, or provides expectations for age-appropriate behaviors	19 (5)	33 (6)
Food parental influence/limit setting	Food/mealtime specific parental influence on what the child eats or how he/she should behave around food	Parent rarely attempts to influence child's eating behaviors, such as just watching as the child takes food from a sibling's plate and eats it	Parent consistently controls and monitors child's eating behaviors; statements such as "Eat like a big boy," "Stay at the table until you are done eating"	11 (4)	23 (6)

TABLE 2 Continued

Variable	Definition	Example of Low Score (1–4)	Example of High Score (6–9)	Percentage (SE) ^a	
				Nonoverweight (n = 60)	Overweight (n = 60)
Indulgent/permissive	The degree to which a parent gives the child an inappropriate degree of freedom to regulate or control his/her own behavior	Rare demonstrations of indulgent behaviors	Fails to make attempts to control the child's behavior and/or almost never provides regulations or sets standards for the child to follow	1.5 (1)	15 (5)
Food indulgent/permissive	Food/mealtime specific permissiveness	Rare food-specific indulgent or permissive behaviors are observed during the meal	Parent allows behavior like letting the child play with his/her food, eat as much as he/she want, or caters to the child's every need at the table	0.5 (0)	12 (4)
Positive reinforcement	The extent to which a parent's response to a child includes the use of praise, approval, rewards, special privileges, or smiles	Parental responses are never affirming or positively reinforcing	Responses to child behavior are frequently affirming and positive	7.0 (3)	ID
Food positive reinforcement	Food/mealtime specific positive reinforcement	Few food-related positive reinforcement statements are made by the parent during the meal	The extent to which the parent uses contingency approval, rewards, or special privileges to reinforce a child's eating behaviors	5 (3)	ID
Inconsistent discipline	Parental inconsistency in following through on expected consequences; failure to maintain and adhere to rules/standards set for child behavior	Parent is consistent or if a parent has no rules, or if there is no evidence of disciplinary behavior	Frequently inconsistent in maintaining and adhering to rules and standards of conduct	1.5 (1)	16 (5)
Food inconsistent discipline	Food/mealtime specific inconsistent discipline	Little food-related inconsistent discipline by parent is observed during the meal	Inconsistent messages about food rules/limits are set by parents during the meal such as "Eat your vegetables" and then parent does not enforce the rule	1.3 (1)	13 (4)
Intrusiveness/control	Assesses intrusive and overcontrolling behaviors that are parent-centered rather than child-centered	Few to no instances in which the parent is overcontrolling and unnecessarily imposes his/her own agenda on the child	Parent controls the interaction, allowing the child little self-direction in activities, may forcefully and physically control the child	2.4 (1)	4.9 (3)
Food intrusiveness/control	Food/mealtime specific intrusiveness or control by the parent; parents agenda to get child to eat, food	Few food-specific intrusive behaviors by the parent are observed during the meal	Statements such as "You must clean your plate," "You shouldn't eat so much," or "You don't need second helpings of that"	1.3 (1)	4.3 (3)

ID, insufficient data.

^aData are presented as mean percentages (SE) of interaction dyads exhibiting high levels (≥ 5 on a scale from 1 to 9) of the relevant behavior (crude) unless otherwise indicated. For example, the "Relationship quality" rate of 70% (nonoverweight column) means that 70% of the relationship dyads in the nonoverweight families had "high" relationship quality scores in comparison with 43% in the overweight families.

^bMean (SE) score on a scale from 1 to 9 (crude).

Statistical Analysis

Descriptive statistics for study variables included means and SDs for continuous variables and frequencies and percentages for categorical variables. Demographic data, including gender, race/ethnicity, age, SES, parent educational level, and parent work status were compiled and presented. For descriptive characteristics of the family meals (Table 3), each family contributed 1 weekday and 1 weekend observation. We accounted for these repeated observations by using generalized estimating equation models with an independent correlation structure. For categorical variables with >2 levels, we present statistical tests for the comparison of each level versus all other levels of that variable (eg, the difference in parents serving the meal versus all other serving styles for overweight versus nonoverweight).

Independent variables were modeled by using separate regressions. Target child overweight status was modeled by using a Poisson regression. Relative risks and 95% confidence intervals were estimated for each exposure. The adjusted probability of overweight/obese was also calculated from each regression model. Crude and adjusted models were run. The adjusted models were adjusted for child- or home-specific characteristics (ie, race/ethnicity, grouped as black/African American, white, American Indian, and other/mixed; age; and gender) and parent characteristics (ie, parent BMI) to address potential confounders. Sampling weights were computed for every individual in this study to reflect the sampling design. Weights were calculated as percentages of the overall sample on the basis of the following characteristics: child BMI, gender, age, and recruitment location. The inverse of these sampling fractions was included as a weight in all analyses to allow estimates to reflect the clinic-level population. Statistical analysis was

TABLE 3 Characteristics of Family Meals

Average Meal	All Participants (N = 120 Families)	Nonoverweight (n = 60 Families)	Overweight/Obese (n = 60 Families)	P ^a
Length of mealtime, mean (SE), min	15.7 (0.9)	18.2 (1.8)	13.5 (0.9)*	.02*
Number of adults present at meal, mean (SE)	1.4 (0.1)	1.4 (0.1)	1.3 (0.1)	.16
Number of children at meal, mean (SE)	2.3 (0.1)	2.2 (0.1)	2.4 (0.2)	.21
Number of siblings at meal (range = 0–6), mean (SE)	1.2 (0.1)	1.1 (0.1)	1.3 (0.2)	.31
Family members present at meal, %				
Mother	85	74	95	.15
Father or stepfather	34	52	18	.01*
Sister	53	53	53	.99
Brother	39	31	47	.18
Meal was a typical family meal (parent report), %	89	85	93	.28
How meal was served, %				
Parent-only; parent preplates meal for family	92	89	95	.47
Family style; everyone plated their own meal	7	10	5	.57
Child-directed; parent involved child in plating the meal	1	1	0	.19
Where family meal took place, %				
Kitchen/dining room	72	80	55	.03*
Family room	20	17	30	.01*
Other	8	3	15	.04*
TV is on in the dining room or adjoining room, %	48	44	52	.50
The family is watching TV, %	34	27	40	.21
Electronic devices present at the table, %	27	28	25	.76
Cell phone	23	25	21	.58
Laptop	4	2	5	.53
Handheld game device	1	0	1	.18
Any screen-time devices used at family meal, %	61	59	62	.81

TV, television.

* Significant ($P < .05$).

^a P values compare nonoverweight with overweight/obese children.

conducted by using Stata (version 13, 2013; StataCorp, College Station, TX).

RESULTS

Descriptive Characteristics of Family Meals

The average length of a family meal was ~16 minutes (Table 3). At least 1 parent (mean: 1.4) and 2 children (mean: 2.3; range: 0–6) were present at family meals; 85% of parents were mothers and 53% of siblings were sisters. More than half of the family meals took place in the kitchen or dining room, and 28% of family meals took place in either the family room or another room in the house (eg, office, bedroom). Approximately 61% of families had some type

of screen-time device on during the meal (eg, television, cell phone, computer, handheld game). Furthermore, in the majority of families, parents preplated family members' meals rather than using a family-style or child-directed (ie, child tells parent what he/she wants and parent plates the child's portion) service style.

There were some differences in family meal logistics by weight status. Children who were overweight/obese had shorter meal times (13.5 vs 18.2 minutes; $P = .02$) and ate family meals less often in the kitchen (55% vs 80%; $P = .03$) and more often in other rooms, such as the family room (30% vs 17%; $P = .01$) or offices or bedrooms (15% vs 3%; $P = .04$). In addition, children who

were nonoverweight were more likely to have a father/stepfather at the meal (52% vs 18%; $P = .01$). No other family meal characteristic significantly differed by child weight status.

Associations Between Interpersonal and Food-Related Family Dynamics at Family Meals and Child Weight Status

Interpersonal Family Dynamics.

Unadjusted analyses and analyses adjusted for demographic characteristics indicated significant associations between the majority of interpersonal family-level dynamics and parent-level dynamics at family meals and child weight status. Specifically, more positive measures (eg, group enjoyment, relationship quality, warmth/nurture) were associated with reduced prevalence

of child overweight/obesity and more negative measures (eg, hostility, indulgent/permissive, inconsistent discipline) were associated with increased prevalence of child overweight/obesity (Table 4). For example, the warmth relative risk of 0.69 in Table 4 indicates that for each additional 10% of relationship dyads coded as having high levels of warmth during family meals there was a 31% lower prevalence of childhood overweight ($P < .01$), after adjusting for child age, race/ethnicity, and gender. The hostility relative risk of 1.09 indicates that for each additional 10% of relationship dyads coded as having high levels of hostility during family meals there was a 9% higher prevalence of childhood overweight ($P < .01$), after adjusting for child age, race/ethnicity, and gender.

Food-Related Family Dynamics.

Unadjusted analyses and analyses adjusted for demographic characteristics indicated that the majority of food-related family-level dynamics and parent-level dynamics at family meals were inversely associated with child weight status, such that family dynamics tended to be more positive in families of nonoverweight children and more negative in families of overweight/obese children (Table 4). For example, the food communication relative risk of 0.84 indicates that for each additional 10% of relationship dyads coded as having high levels of food-related communication during family meals there was a 16% lower prevalence of childhood overweight ($P = .05$), after taking into account the influence of child age, race/ethnicity, and gender.

TABLE 4 Crude and Adjusted RRs of a Child Being Overweight in Relation to Family- and Parent-Level Emotional and Food-Related Dynamics During Family Meals

	Crude RR ^a	95% CI	P	Adjusted RR ^b	95% CI	P	Adjusted + BMI RR ^c	95% CI	P
Emotional atmosphere									
Group enjoyment	0.80	(0.68–0.94)	.01*	0.84	(0.75–0.94)	.00*	0.88	(0.78–0.99)	.03*
Relationship quality	0.91	(0.85–0.98)	.01*	0.93	(0.88–0.98)	.01*	0.94	(0.89–1.00)	.05*
Hostility	1.11	(1.05–1.18)	.00*	1.09	(1.03–1.14)	.00*	1.06	(1.00–1.13)	.05*
Lecture/moralize	1.15	(0.97–1.37)	.11	1.19	(1.05–1.35)	.01*	1.12	(0.94–1.33)	.20
Warmth	0.70	(0.54–0.92)	.01*	0.69	(0.52–0.92)	.01*	0.70	(0.55–0.89)	.00*
Communication	0.95	(0.88–1.02)	.15	0.96	(0.91–1.01)	.11	0.99	(0.93–1.05)	.75
Silent/pause	1.11	(1.04–1.18)	.00*	1.06	(1.00–1.13)	.06	1.12	(1.03–1.21)	.01*
Parental influence	1.04	(0.99–1.10)	.11	1.04	(1.00–1.08)	.04*	1.04	(1.00–1.07)	.08
Indulgent/permissive	1.08	(1.04–1.12)	.00*	1.06	(1.02–1.10)	.00*	1.05	(1.00–1.09)	.03*
Inconsistent discipline	1.08	(1.04–1.13)	.00*	1.06	(1.02–1.10)	.00*	1.05	(1.00–1.10)	.04*
Positive reinforcement ^d	—	(—)	—	—	(—)	—	—	(—)	—
Intrusiveness	1.04	(0.98–1.11)	.19	1.03	(0.97–1.09)	.35	1.03	(0.95–1.11)	.51
Food-related emotional atmosphere									
Food hostility	1.18	(1.09–1.27)	.00*	1.14	(1.06–1.22)	.00*	1.07	(0.98–1.17)	.12
Food lecture/moralize	1.23	(1.12–1.36)	.00*	1.22	(1.07–1.40)	.00*	1.23	(1.03–1.46)	.02*
Food warmth ^d	—	(—)	—	—	(—)	—	—	(—)	—
Food communication	0.81	(0.67–0.98)	.02*	0.84	(0.71–1.00)	.05*	0.87	(0.74–1.03)	.11
Food parental influence	1.08	(1.00–1.10)	.05*	1.03	(1.00–1.07)	.08	1.03	(0.98–1.07)	.22
Food indulgent permissive	1.09	(1.05–1.13)	.00*	1.07	(1.02–1.11)	.00*	1.05	(1.00–1.10)	.08
Food inconsistent discipline	1.08	(1.04–1.13)	.00*	1.06	(1.01–1.10)	.01*	1.04	(0.99–1.10)	.13
Food positive reinforcement ^d	—	(—)	—	—	(—)	—	—	(—)	—
Food intrusiveness	1.05	(1.00–1.10)	.04*	1.04	(1.00–1.09)	.04*	1.04	(0.97–1.11)	.27

$N = 120$. Each RR is per a 10% change in the family-level atmosphere variable. *Significant ($P < .05$). RR, relative risk.

^a Crude RR results take into account only the emotional atmosphere score itself. A score < 1 suggests that the emotional atmosphere characteristic is associated with a lower risk of being overweight. For example, the “relationship quality” crude RR of 0.91 indicates that each additional 10% of dyads exhibiting relationship quality is associated with a 9% lower risk of being overweight. A score > 1 suggests a higher risk of being overweight; for example, each additional 10% of dyads exhibiting “food hostility” (crude RR of 1.18) is associated with a 18% higher risk of being overweight.

^b Adjusted RR results take into account the effects of age, race (4 categories), and gender on overweight status when estimating children’s risk of being overweight.

^c Adjusted + BMI RR results take into account the effects of age, race (4 categories), gender, and the primary caregiver’s BMI on overweight status when estimating children’s risk of being overweight.

^d Not enough data to assess these variables; families with overweight children had no dyadic interactions that were coded as positive.

When additionally adjusted for the primary caregiver's BMI, some results for family- and parent-level interpersonal dynamics and food-related dynamics were attenuated. For example, lecture/moralize, parental influence, food hostility, food communication, food intrusiveness, parental food indulgent/permissive, and parental food inconsistent discipline were no longer significantly related to child overweight/obese status. However, many of the significant patterns found in the earlier results held. For example, group enjoyment, relationship quality, and warmth were still significantly associated with a reduced prevalence of overweight/obesity in children and hostility, parental indulgent/permissive, parental inconsistent discipline, and food lecture/moralizing were still significantly associated with an increased prevalence of overweight/obesity in children.

DISCUSSION

Results showed that family meals were relatively short, included multiple family members with at least 1 parent and sibling, were eaten primarily in the kitchen, and were parent-plated. These characteristics of family meals may be helpful for intervention researchers or health care providers to share with parents when trying to help families increase the frequency of family meals without a lot of burden. For example, having short meals (ie, 20 minutes) may be more manageable for families than longer meals and thus may encourage families to prioritize family meals.

Furthermore, results indicated that the majority of positive family- and parent-level interpersonal and food-related dynamics (eg, group enjoyment, relationship quality) during family meals were associated with a reduced prevalence of childhood overweight. In addition, the majority of negative family- and parent-level interpersonal and food-related dynamics (eg, hostility,

parent indulgent/permissiveness, food-related parent inconsistent discipline) during family meals were associated with an increased prevalence of childhood overweight. Previous research on the home environment and Family Systems Theory corroborate these findings.^{16–18} For example, previous research has shown that high family functioning (eg, good communication, positive interpersonal relationships, good problem-solving skills) is associated with lower adolescent BMI, more fruit and vegetable intake, and frequent family meals.¹⁶ Thus, it would be important for interventions that aim to reduce childhood obesity, or increase family meals, to pay attention to training families how to attend to both interpersonal dynamics and food-related dynamics at family mealtimes.

Findings from this study both corroborate and extend previous limited direct observational research on family meals. Specifically, previous research has suggested that family meal frequency is protective for children in relation to dietary intake^{1–3}; the current study identified potential mechanisms via interpersonal and food-related dynamics during family meals that should be further researched to help explain why family meals are protective. Specifically, future research should explore whether interpersonal family and food-related dynamics between certain family members (eg, siblings versus parent/child) are more strongly associated with a reduced risk of childhood obesity. In addition, it would be important to examine the combined influence of the quality of the food served at family meals and the quality of the interpersonal atmosphere during family meals in relationship to childhood obesity and dietary intake.

This study had several strengths. First, a more in-depth assessment of family interpersonal and food-related dynamics at family meals was attained via the

use of direct observational methods. In addition, bidirectional measures (ie, coding ≥ 2 people's interactions with each other) of family and parent variables were used to capture a more systemic measure of family dynamics, which is rarely done. However, there are also study limitations. First, the study was cross-sectional and temporality cannot be implied. In addition, we conducted many tests of hypotheses and although estimation, rather than statistical significance, is our main interest, multiple comparisons can be problematic and results should be interpreted with this in mind. Our small sample size also limited our ability to fully adjust for all possible confounders. Furthermore, although we used a sensitizing period for video-recording family meals, families may still have modified their behavior because they were being video-recorded.

CONCLUSIONS

This study identified characteristics of family meals (eg, interpersonal and food-related dynamics) through direct observational methods that may help explain the inconsistencies found in previous studies regarding the frequency of family meals and childhood obesity status. Future longitudinal research is needed to corroborate study results. There are also implications for health care providers and public health researchers who work with families and children. First, it would be important for providers to simply ask parents whether they are having family meals (eg, during a well-child visit) in order to highlight the importance of family meals. Second, providers could offer a more concrete picture regarding the characteristics of family meals (eg, family meals can be as short as 20 minutes) so that parents feel they are more doable. Third, providers could discuss specific behaviors parents should encourage around the table (eg, communication; such as telling parents

they can have each family member tell a high and a low from their day) to help families participate in more family meals. In addition, public health researchers

who use family-based interventions may want to focus on promoting positive (eg, group enjoyment, relationship quality) versus negative (eg, hostility, parental

inconsistent discipline) interpersonal dynamics during family meals to help more families benefit from the protective nature of family meals.

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