



Published in final edited form as:

J Acad Nutr Diet. 2013 June ; 113(6): 816–822. doi:10.1016/j.jand.2013.02.004.

Structural and Interpersonal Characteristics of Family Meals: Associations with Adolescent BMI and Dietary Patterns

Jerica M. Berge, PhD., MPH, LMFT, CFLE¹, Seok Won Jin, MSW, MA, LGSW², Peter Hannan, MStat³, and Dianne Neumark-Sztainer, PhD, MPH, RD³

¹University of Minnesota Medical School, Department of Family Medicine and Community Health

²University of Minnesota, School of Social Work

³University of Minnesota, Division of Epidemiology and Community Health

Abstract

The last decade of research has suggested that family meals play an important role in promoting healthful dietary intake in youth. However, little is known about the structural characteristics and interpersonal dynamics of family meals that may help to inform why family meals are protective for youth. The current mixed methods, cross-sectional study conducted in 2010–2011 includes adolescents and parents who participated in two linked population-based studies. Participants included 40 parents (91.5% female) and adolescents (57.5% female) from the Minneapolis/St. Paul area participating in EAT 2010 and F-EAT. The structural (e.g. length of the meal, types of foods served) and interpersonal characteristics (e.g., communication, emotion/affect management) of family meals were described and associations between interpersonal dynamics at family meals and adolescent body mass index (BMI) and dietary intake were examined via direct observational methods. Families were video-recorded during two mealtimes in their homes. Results indicated that family meals were approximately 20 minutes in length, included multiple family members, were typically served family style (70%) and occurred in the kitchen 62% of the time and 38% of the time in another room (e.g., family room, office). Additionally, significant associations were found between positive interpersonal dynamics (i.e., communication, affect management, interpersonal involvement, overall family functioning) at family meals and lower adolescent BMI and higher vegetable intake. These findings add to the growing body of literature on family meals by providing a better understanding of what is happening at family meals in order to inform obesity prevention studies and recommendations for providers working with families of youth.

Keywords

Family meals; direct observation; BMI; fruit and vegetable intake; interpersonal dynamics; adolescents; parents

INTRODUCTION

Research over the last decade has suggested that family meals play an important role in promoting healthful dietary intake in adolescents. Cross-sectional and longitudinal research on boys and girls from diverse ethnic/racial backgrounds suggests that family meals are associated with increased fruit and vegetable intake,^{1–3} lower levels of extreme weight control behaviors,⁴ and better psychosocial health.⁵ There is also evidence that family meals

Address for correspondence: Jerica M. Berge, PhD, LMFT, Department of Family Medicine and Community Health, Phillips Wangensteen Building, 516 Delaware Street SE, Minneapolis, MN 55455, Voice: 612-626-3693, mohl0009@umn.edu.

may be protective against obesity, although findings have been inconsistent across studies.^{6,7} Research findings pointing to the protective nature of family meals have generated interest in understanding more about the characteristics of family meals and the key protective factors related to family meals. Specifically, it is of interest to investigate characteristics of family meals, such as interpersonal dynamics during the meal (e.g., communication, behavior management; Table 1), structure of the meals (e.g., chaotic, routine), and logistics of the meal (e.g., length of the meal, who is present at the meal, what is eaten).

Given concerns about poor dietary behaviors in adolescence and the high prevalence of obesity in adolescents,^{8,9-11} investigating characteristics of the family meal that are associated with dietary intake and weight outcomes is of high importance. Specifically, knowing more about what is occurring at family meals may assist in the development of interventions aimed at increasing the frequency and improving the quality (in terms of both food served and atmosphere at meals) and more specifically, lead to identifying modifiable factors to target for family-based adolescent obesity prevention interventions. Thus, the main aim of this study is to use a mixed methodological approach to describe (qualitative) the structural and interpersonal dynamics of family meals and to conduct preliminary analyses (quantitative) to test the association between the interpersonal dynamics at family meals and adolescent dietary intake and BMI z-score.

Previous research examining structural characteristics and interpersonal dynamics at family meals has been very limited. One cross-sectional study with adolescents examined the specific types of foods served at dinner. Results showed that approximately 30% of families served fruit, milk or a salad for dinner, while 50% or more reported that their families served vegetables and sugar-sweetened beverages.¹² Additionally, specific sociodemographic characteristics (low education), psychosocial characteristics (high work-life stress, depressive symptoms, low family functioning), and personal beliefs and behaviors (low value of family meals, low enjoyment of cooking, low meal planning and fewer hours in food preparation) were associated with lower healthfulness of foods served at family meals.¹² Two cross-sectional, direct observational studies examining interpersonal dynamics at family meals with overweight children found that families with an obese child had difficulties with interpersonal dynamics during the family meal time, such as, managing family members' emotions, interpersonal involvement, parental discipline, and role division during family meals as compared to families with non-overweight children.^{13,14} Thus, limited quantitative and qualitative studies suggest that structural and interpersonal dynamics during family meals may be associated with youth weight and weight-related behaviors. However, more research is needed that can comprehensively examine structural and interpersonal dynamics during family meals simultaneously, such as studies using mixed methods. Additionally, direct observational research that draws on a more racially/ethnically and socio-economically diverse population is needed because previous research has primarily been conducted with white, mid- to upper- socioeconomic status families.

The current study builds upon the extant literature on family meals by employing direct observational methods in a diverse sample of adolescents to address the following research questions: (1) What are the common characteristics of family meals among families with adolescents (e.g., length of meal, distractions at the meal, people present at the meal, what is served at the meal)?; (2) What types of interpersonal dynamics occur during family meals (e.g., healthy communication, positive affect, behavioral control)?; and (3) Is there an association between positive interpersonal dynamics during family meals and more healthful dietary intake and lower body mass index (BMI) in adolescents? The main exploratory hypothesis of the current study is that families with more positive interpersonal dynamics

during family meals will have adolescents with more healthful dietary intake patterns and BMI z-scores.

METHODS

Sample and Study Design

The study sample included 41 families who participated in the Family Meals, LIVE! pilot study, a sub-study of two linked multi-level studies—EAT 2010 (Eating and Activity Among Teens)¹⁵ and Families and Eating and Activity among Teens (F-EAT).^{12,16}

In EAT 2010, surveys, food frequency questionnaires and anthropometric measures were completed by 2,793 adolescents from 20 public middle schools and high schools in the Minneapolis/St. Paul metropolitan area of Minnesota during the 2010 academic year. The mean age of the study population was 14.4 years (SD=2.0) and adolescents were equally divided by gender (46.8% boys, 53.2% girls). The racial/ethnic backgrounds of the participants were as follows: 18.9% white, 29.0% African American or Black, 19.9% Asian American, 16.9% Hispanic, 3.7% Native American, and 11.6% mixed or other. The socioeconomic status (SES) of participants included: 29.4% low SES, 24.3% low-middle SES, 33.3% Middle SES, 6.4% Upper-Middle SES, and 2.8% High SES.

For Project F-EAT, data were collected by surveying up to two parents/caregivers (n=3,709) of the adolescents participating in EAT 2010. In total, 85.3% of adolescents in EAT 2010 had one parent respond and 47.5% had two parents respond. Parent participants had a mean age of 42.3 years (SD=8.6). The majority of parent respondents were mothers or other female guardians (62.0%). Participating parents were racially/ethnically and socioeconomically diverse similar to EAT 2010 adolescents.¹⁶

Families (n=41) who had participated in both Project EAT and F-EAT were eligible to participate in the Family Meals, LIVE! pilot study. Participants were randomly selected from the list of parents who participated in Project F-EAT. Approximately 150 families were recruited through fliers sent out to parents after they completed the Project F-EAT survey. Families self-selected to participate in this study and agreed to have two family meals video-recorded in their home within two weeks of each other. The average time between data collection for EAT 2010/F-EAT and participation in the Family Meals, LIVE! pilot study was 2 weeks (range=1–4.5 weeks). There were no statistically significant differences between parents and adolescents who participated in the Family Meals, LIVE! pilot study and parents and adolescents who participated in EAT 2010 or F-EAT. Families participating in the Family Meals, LIVE! pilot study were similar to the ethnic/racial and socio-economic diverse population in EAT 2010 and F-EAT. Race/ethnicity included: black (45%), Caucasian (35%) or Latino (10%), with a small percentage from other race/ethnicities (Asian 5%, American Indian 2%, Mixed 3%). SES of families included: 33.3% low SES, 20.5% low-middle SES, 15.4% Middle SES, 5.13% Upper-Middle SES, and 10.3% High SES.

Two video-recordings of family meals were conducted, based on direct observational literature showing that a “sensitizing period,” such as recording more than one observation, is used to allow participants to acclimate and become less reactive (i.e., more representative behavior) to the direct observational equipment.^{17–19} During the in-home family meal video-recordings, families were told to eat as they normally do, including moving to locations within the house where they typically eat their meals (e.g., family room). 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. Families were asked to record two weeknight family dinners exactly one week apart. All

family members were required to be present at both meals. Research team members set-up the video equipment in the room the family designated and then left the house until the family had completed their meal. All 41 families completed all aspects of data collection. All participants (i.e., all family members in the videos) were consented or assented into the study. All study protocols were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee.

Measures

Direct observational measures, including the Mealtime Interaction Coding System (MICS) and mealtime characteristics, and adolescent health outcome measures (i.e. BMIZ and fruit and vegetable intake) used in the study are described in detail in Table 2.

Statistical Analysis

To allow for a sensitizing period (i.e., screening effect), only the second video-recording (taken within 7 days) was used in analyses. Descriptive statistics were conducted to examine qualitative characteristics of the family meal. The mean length of the meal, number of family members present at the meal, and number of times an adult and/or child left the table during mealtime were calculated. In addition, frequency/prevalence of the types of food served, parent's handling of child behavior, and location of family meals were run. The descriptive analyses were also stratified by weight status of the adolescent to identify patterns by weight status.

For quantitative analyses, tests of linearity were conducted first to assess the linear relationship between the dependent and independent variables (through plotting the observed versus predicted values). One observation was identified as an outlier and was dropped from the models (n=40). General Linear Modeling was then used to estimate and test associations between each measure of family interpersonal dynamics (task accomplishment, communication, affect management, interpersonal involvement, behavior control, roles, and overall family functioning) and each adolescent outcome measure (BMIZ, fruit and vegetable intake). Although descriptive statistics were stratified by non-overweight and overweight/obese to identify patterns by weight status, stratification was not used in the General Linear Models due to the unequal distribution of the groups. Also, in this exploratory study, p-values less than 0.05 were used to point to aspects of greater interest rather than for strict hypothesis testing. Hence adjustment for multiple testing is not warranted. All analyses were conducted using SAS 9.2 (2002–2008) (SAS Institute, Inc, Cary, NC).

Results

Descriptive Characteristics of Family Meals

The average length of a family meal was 19 minutes (SD= 7.3) (Table 2). At least one parent was present at the family meal (mean = 1.59; SD = 0.74), with 83% (33/40) of parents being mothers and 38% (15/40) being fathers. On average, there were two or more children present at the family meal (mean = 2.6 children; SD = 1.2). The age range of the children present at the family meal was between 6 months-18 years. Over half of the family meals took place in the kitchen or dining room (25/40; 62%), but 38% (15/40) of family meals took place in either the family room or another room in the house (e.g., office, bedroom). Approximately 35% (14/40) of families had a TV on in the same room as the family meal, or in an adjoining room.

The majority of families (28/40; 70%) served their meals family style. This entailed taking the prepared food to the table and having all family members dish up their own food. In 15%

(6/40) of families, parents pre-plated the food and in 10% (4/40) of families, the child was an active participant in choosing food, determining portion size, and directing what to put on their plate while the adult plated the food for the child. These percentages were similar when looking at families of normal weight or overweight/obese children.

It was common for families to serve some type of meat for dinner (categories are not mutually exclusive). For example, 38% (15/40) of families had red meat and 50% (20/40) had white meat (i.e., chicken, pork, fish). Pasta was served by 40% (16/40) of families and 45% (18/40) had some type of bread/tortilla or rice for dinner. Over 75% (31/40) of families served a vegetable for dinner, while only 18% (7/40) served fruit and approximately a quarter of families (10/40) had dairy foods available for dinner. Approximately 60% (24/40) of families served either milk or water for dinner, 15% (6/40) served a sugar-sweetened beverage and 33% (13/40) did not serve a beverage. Only 8% of families (3/40) served a dessert for dinner. Similar food service patterns and food consumption patterns were noted in normal weight children and overweight/obese children.

When parents were confronted with resistance from their child (i.e., “picky eater”) regarding eating certain foods (e.g., vegetables), the majority of parents responded in one of two ways. First, parents used verbal coaxing (18/40; 45%). Verbal coaxing included trying to explain to the child the importance of eating a certain food, or compromising/bargaining with the child, such as telling them that they could have dessert after they ate their vegetable, or that trying everything on their plate was a family rule. The other most common response (16/40; 40%) to a picky eater was collaboration with the child in solving the problem. Only 13% (5/40) of parents used coercion. This response included threats or intimidation to get the child to eat their food, such as telling the child that they had to finish their vegetable or they couldn't leave the table. Similar parent response patterns to child picky eating were noted in normal weight children and overweight/obese children.

Preliminary Analyses: Associations between Interpersonal Dynamics at Family Meals and Adolescent and Adult Weight and Health Behaviors

Quantitative results indicated a significant association between six of the seven healthy family meal interpersonal dynamics (i.e., communication, affect management, interpersonal involvement, overall family functioning) and lower Body Mass Index (BMI) in adolescents (Table 3). For example, for every one point increase in healthy communication at family meals, adolescent BMI was lower by 0.28 z-score units ($p = 0.023$).

There were significant positive associations between all seven family meals interpersonal dynamics variables (i.e., task accomplishment, communication, affect management, interpersonal involvement, behavior control, roles and overall family functioning) and higher consumption of vegetables in adolescents (Table 3). For example, for every one point increase in behavior control, adolescent vegetable consumption was higher by 0.64 ($p = 0.006$). There were no significant associations between family meal interpersonal dynamics and adolescent fruit consumption.

DISCUSSION

The main aim of this mixed methods, exploratory study was to describe structural and interpersonal characteristics of family meals and to conduct preliminary analyses to identify whether family meal interpersonal dynamics (e.g. communication, warmth, behavior control) were associated with adolescent health outcomes (i.e., BMI, fruit and vegetable intake). Results indicated that family meals were not lengthy, included multiple family members at the meal with at least one adult present, were eaten in the kitchen or another room in the house, were served family style and typically included meats, pasta/bread,

vegetables and milk/water, and did not end with dessert being served. This picture of family meals may potentially be useful for intervention researchers to use with families when trying to help them increase the frequency of family meals while exerting the least effort. For example, the relatively short length of time families in the study took to eat family meals may be encouraging for other families when considering whether to devote the time to carry out a family meal.

Additionally, results suggested that families with positive interpersonal dynamics during family meals had adolescents who ate more vegetables and had lower BMIs. Thus, it may be the case that families who make family meals a routine (task accomplishment), clearly and directly share information with each other at meals (communication), express feelings during the meals (affect management), show genuine concern and interest in one another's lives during the meals (interpersonal involvement), have predictable rules and expectations at family meals (behavior control), have shared and individual roles specific to the meal (roles), and have high quality exchanges (overall family functioning) during family meals have adolescents with more vegetable intake and lower BMIs.

Findings from the current study extend previous research on family meals. While past research has suggested that family meal frequency is protective for adolescents, in relation to dietary intake¹⁻³, and weight and weight-related behaviors,⁶ the current study identified potential mechanisms (i.e., positive interpersonal dynamics) for further research exploration that may help explain why family meals are protective. Future research should confirm current findings with a larger racially/ethnically and socio-economically diverse sample and explore further aspects of interpersonal dynamics during family meals in order to identify whether specific components (e.g., communication) of interpersonal dynamics are more important than others in predicting healthful adolescent health outcomes and whether interpersonal dynamics between certain family members (e.g., siblings vs. parent/child) are more protective of healthful adolescent outcomes.

This study had several strengths. First, the use of direct observational methods allowed for a more in-depth and comprehensive measurement of family level interpersonal behaviors in the home environment related to family meals. Additionally, the current sub-study was connected to two large multi-level studies with diverse socio-economic and racial/ethnic participants. However, findings from the present study must also be interpreted in light of certain limitations. One limitation is the small sample size ($n = 41$), thus limiting power and generalizability. Additionally, the majority of families participating in the sub-study were either black or white, were less overweight than participants in the EAT 2010 and F-EAT samples, and self-selected to be in the sub-study. Furthermore, although the first family video-recorded family meal was used as the sensitizing period and excluded from analyses, families still may have modified their behavior due to being video-recorded. Finally, this study was cross-sectional, thus, temporal causality cannot be implied and it is important to note that other unaccounted variables may be explaining the significant associations found in the current study.

CONCLUSIONS

Results from this exploratory, mixed methods study represent a first step in identifying the structural and interpersonal characteristics of family meals that may help explain the significant associations found in the literature between family meal frequency and adolescent healthful eating behaviors. Future research should investigate the results found in the current study with a larger more representative sample in order to confirm significant findings and to inform future family meals intervention research. There are also practice-based implications that can be explored based on the results of this study. For example,

dietitians, health care providers and public health interventionists who work with families may be able to provide a better description of the characteristics of family meals, in order to make it possible for more families to participate in family meals. Additionally, providers may want to consider educating families about the importance of interpersonal dynamics, and the specific components of interpersonal dynamics, at family meals.

References

1. Gable S, Lutz S. Household, parent and child contributions to childhood obesity. *Family Relations*. 2000; 49(3):293–300.
2. Gillman MW, Rifas-Shiman SL, Frazier AL, Rockett HRH, Camargo CA, Field AE, Berkley CS, Colditz GA. Family dinner and diet quality among older children and adolescents. *Archives of Family Medicine*. 2008; 9:235–240. [PubMed: 10728109]
3. Neumark-Sztainer D, Hannan PJ, Story M, Croll J, Perry C. Family meal patterns: Associations with sociodemographic characteristics and improved dietary intake among adolescents. *Journal of the American Dietetic Association*. 2003; 103(3):317–322. [PubMed: 12616252]
4. Neumark-Sztainer D, Eisenberg ME, Fulkerson JA, Story M, Larson NI. Family meals and disordered eating in adolescents: Longitudinal findings from Project EAT. *Archives of Pediatrics and Adolescent Medicine*. 2008; 162:17–22. [PubMed: 18180407]
5. Eisenberg ME, Olson RE, Neumark-Sztainer D, Story M, Bearinger LH. Correlations between family meals and psychosocial well-being among adolescents. *Archives of Pediatrics and Adolescent Medicine*. 2004; 158:792–796. [PubMed: 15289253]
6. Fulkerson JA, Neumark-Sztainer D, Hannan PJ, Story M. Family meal frequency and weight status among adolescents: Cross-sectional and five-year longitudinal associations. *Obesity*. 2008; 16:2529–2534. [PubMed: 18719674]
7. Larson NI, Neumark-Sztainer D, Hannan PJ, Story M. Family meals during adolescence are associated with higher food quality and healthful meal patterns during young adulthood. *Journal of the American Dietetic Association*. 2007; 107:1502–1510. [PubMed: 17761227]
8. Larson NI, Neumark-Sztainer D, Harnack L, Wall M, Story M, Eisenberg ME. Calcium and dairy intake: Longitudinal trends during the transition to young adulthood and correlates of calcium intakes. *Journal of Nutrition Education and Behavior*. 2009; 41(4):254–260. [PubMed: 19508930]
9. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999–2004. *JAMA*. 2006; 295(13):1549–1555. [PubMed: 16595758]
10. Larson NI, Neumark-Sztainer D, Hannan PJ, Story M. Trends in adolescent fruit and vegetable consumption, 1999–2004: Project EAT. *American Journal of Preventive Medicine*. 2007; 32:147–150. [PubMed: 17234489]
11. Larson NI, Neumark-Sztainer D, Harnack L, Wall M, Story M, Eisenberg ME. Fruit and vegetable intake correlates during the transition to young adulthood. *American Journal of Preventive Medicine*. 2008; 35(1):33–37. [PubMed: 18482818]
12. Neumark-Sztainer D, MacLehose RF, Loth K, Fulkerson JA, Eisenberg M, Berge JM. What's for dinner? Types of foods served at dinner differ across parent and family characteristics. *Appetite*. in press.
13. Jacobs M, Fiese B. Family mealtime interactions and overweight children with asthma: Potential for compounded risks? *Journal of Pediatric Psychology*. 2007; 32(1):64–68. [PubMed: 16951307]
14. Moens E, Braet C, Soetens B. Observation of family functioning at mealtime: A comparison between families of children with and without overweight. *Journal of Pediatric Psychology*. 2007; 32(1):52–63. [PubMed: 16801324]
15. Berge JM, Wall M, Larson N, Loth K, Neumark-Sztainer D. Family functioning: Associations with weight status, eating behaviors and physical activity in adolescents. *Journal of Adolescent Health*. in press.
16. Berge JM, MacLehose RF, Loth K, Eisenberg ME, Fulkerson J, Neumark-Sztainer D. Family meals: Associations with weight and eating behaviors among mothers and fathers. *Appetite*. 2012; 58:1128–1135. [PubMed: 22425759]

17. Gardner F. Methodological issues in the direct observation of parent-child interaction: Do observational findings reflect the natural behavior of participants? *Clinical Child and Family Psychology Review*. 2000; 3(1)
18. Haidet K, Tate J, Divirgilio-Thomas D, Kolanowski LA, Happ M. Methods to improve reliability of video-recorded behavioral data. *Research in Nursing & Health*. 2009; 32:9.
19. Paterson B, Bottorff J, Hewat R. Blending observational methods: Possibilities, Strategies, and challenges. *International Journal of Qualitative Methods*. 2003; 2(1):19.
20. Dickstein, S.; Hayden, LC.; Schiller, M.; Seifer, R.; WSA. Adapted from the McMaster Clinical Rating Scale. East Providence, RI: E.P. Bradley Hospital; 1994. Providence Family Study mealtime family interaction coding system.
21. Epstein NB, Baldwin LM, Bishop D. The McMaster Family Assessment Device. *Journal of Marital and Family Therapy*. 1983; 9(2):171–180.
22. Morse, JM.; Field, PA. *Qualitative Research Methods for Health Professionals*. 2. Thousand Oaks, CA: Sage Publications; 1995.
23. Benson, J.; Munoz, S. *Mealtime Observation Form*. Syracuse University; 2004.
24. Kuczumarski RJ, Ogden CL, Guo SS, et al. 2000 CDC Growth Charts for the United States: methods and development. *Vital Health Stat*. 2002; (246):1–190. Series 11.
25. Rockett HRH, Breitenbach MA, Frazier AL, et al. Validation of a youth/adolescent food frequency questionnaire. *Preventive Medicine*. 1997; 26(6):808–816. [PubMed: 9388792]
26. Rockett HR, Wolf AM, Colditz GA. Development and reproducibility of a food frequency questionnaire to assess diets of older children and adolescents. *Journal of the American Dietetic Association*. 1995; 95(3):336–340. [PubMed: 7860946]

Table 1

Definitions of the McMaster Mealtime Interpersonal Dynamics Coding Scales and Means(SD) and Ranges of McMaster Scores for Obese and Non-Obese Adolescents

Mealtime Interactions	Description	Low Score	High Score	Mean (SD)		Range	
				Non-Obese (n=28)	Obese (n=12)	Non-Obese (n=28)	Obese (n=12)
Task Accomplishment	Structure of meal. Is a Routine followed? Do families finish the meal?	Chaotic. Disruptions are not acknowledged or addressed	Flexible, smooth transitions, efficient planning, and noticeable routine	6.00 (1.5)	5.8 (0.8)	1-7	5-7
Communication	Exchange of information	Ineffective communication; silence or irrelevant talking	Clear and direct. Messages are acknowledged	5.27 (1.2)	4.5 (1.2)	3-7	3-6
Affect Management	Appropriateness and relevance of emotional expression.	Difficulty with affective/emotional production and response.	Affect enhances family interaction. The range, intensity of emotional expression is appropriate, valued, and encouraged	5.10 (1.4)	4.9 (0.9)	2-7	2-7
Interpersonal Involvement	How family members value the activities and concerns of others	Lack of involvement, lack of privacy, unclear boundaries, and few independent decisions made	Empathic involvement in members' activities and concerns, genuine interest in the activities of others	5.17 (1.6)	4.3 (1.3)	1-7	1-7
Behavior Control	The manner in which families express and maintain behavioral standards	Unpredictable or chaotic behavior control. Both parents and children exhibit problems which often results in conflict	Flexible style, standards are clear and predictable, reflecting respect for others. Constructive elaboration on appropriate behavior	5.27 (1.1)	5.6 (1.0)	3-7	3-7
Roles	How members fulfill meal functions. Are dinner time activities fairly distributed, age-appropriate, and assigned?	Lack of or inappropriate task assignment, lack of responsibility for tasks	Family assigns and takes responsibility for tasks smoothly and efficiently	6.10 (1.2)	6.6 (0.7)	3-7	3-7
Overall Family Functioning	Overall level of family functioning. Rater's general clinical impression, taking into account strengths and weaknesses of the family	Generally unpleasant and challenging to view, characterized by chaos	High quality of interactions and a sense that all have enjoyed the mealtime and each other's company	5.20 (1.2)	4.7(1.0)	3-7	3-7

Table 2

Measures used in the Family Meals. LIVE! Pilot Study

Measure	Description
<i>Mealtime Interaction Coding System (MICS)</i>	<ul style="list-style-type: none"> The Mealtime Interaction Coding System (MICS)²⁰ was used to code family meal interpersonal dynamics.²¹ The MICS consists of seven subscales (see Table 1). The MICS has been used to reliably distinguish patterns of parent and child interactions around family meals and has been found to be valid in racially/ethnically and socio-economically diverse families.¹³ Two research assistants were trained on the MICS coding system by the first author and established high interrater reliability. The two research assistants coded all video-recorded data with the first author doing reliability checks on every fifth observation.²² Intraclass correlations calculated for interrater reliability were high (range=0.89–0.98).
<i>Mealtime Characteristics</i>	<ul style="list-style-type: none"> The Mealtime Observation Form, validated in previous studies,²³ was used to capture structural characteristics of the mealtime environment. Eight categories were coded: length of meal, number of adults and children present at meal, how the meal is served, where the meal takes place, television on/off, how many times the child and parent leave the table, types of food served, and parents response to child's picky eating behavior. Training of the two research assistants on the Mealtime Observation Form followed the same protocol as the MICS. Intraclass correlations were calculated for interrater reliability and were acceptable, ranging from 0.90–1.00.
<i>Adolescent BMI</i>	<ul style="list-style-type: none"> Adolescents in EAT 2010 had height and weight measured at school by trained research staff in a private area with standardized equipment and procedures. Adolescents were asked to remove shoes and outerwear (e.g., heavy sweaters). BMI values were calculated according to the following formula: weight (kg)/height (meters)² and converted to z-scores, standardized for gender and age.²⁴
<i>Adolescent Dietary Intake</i>	<ul style="list-style-type: none"> Adolescent dietary intake was assessed in EAT 2010 adolescents with the 149-item Youth and Adolescent Food Frequency Questionnaire (YAQ).²⁵ For fruit and vegetable intake, daily servings were defined as the equivalent of one-half cup. Validity and reliability of the YAQ have been previously tested with youth and found to be within acceptable ranges for dietary assessment tools.^{25,26} Test-retest correlations between two YAQs over a one-year period were 0.49 for fruit, and 0.48 for vegetables.

Table 3
Associations between McMaster Family Interpersonal Dynamics Scores and Adolescent BMIz and Fruit and Vegetable Intake

	Task Accomplishment		Communication		Affect Management		Interpersonal Involvement		Behavior Control		Roles		Overall Family Functioning	
	beta (SE)	p-value	beta (SE)	p-value	beta (SE)	p-value	beta (SE)	p-value	beta (SE)	p-value	beta (SE)	p-value	beta (SE)	p-value
BMIz-score	-0.07 (0.11)	0.519	-0.28 (0.12)	0.023	-0.26 (0.12)	0.029	-0.23 (0.09)	0.016	-0.01 (0.15)	0.961	-0.06 (0.14)	0.653	-0.30 (0.12)	0.019
Fruit Intake	0.16 (0.11)	0.146	0.06 (0.12)	0.634	0.13 (0.12)	0.271	0.10 (0.10)	0.323	0.19 (0.14)	0.174	0.01 (0.14)	0.934	0.16 (0.12)	0.186
Vegetable Intake	0.42 (0.18)	0.023	0.43 (0.20)	0.032	0.53 (0.19)	0.007	0.40 (0.15)	0.013	0.64 (0.22)	0.006	0.53 (0.22)	0.019	0.50 (0.21)	0.021

Acad Nutr Diet. Author manuscript; available in PMC 2014 June 01.