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The Protective Role of Family Meals for Youth Obesity: 10-year Longitudinal Associations

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Abstract

Objective—To examine whether having family meals as an adolescent protects against becoming overweight or obese 10 years later as a young adult.

Study design—Data from Project EAT-III, a longitudinal cohort study with emerging young adults, were used. At baseline (1998-1999) adolescents completed surveys in middle or high schools and at 10-year follow-up (2008-2009) surveys were completed online or via mailed surveys. Young adult participants (n=2117) were racially/ethnically and socioeconomically diverse (52% minority; 38% low income) between the ages of 19-31 (mean age=25.3; 55% female). Logistic regression was used to associate weight status at follow-up with family meal frequency 10-years earlier during adolescence, controlling and testing for interactions with demographic characteristics.

Results—All levels of baseline family meal frequency (i.e., 1-2, 3-4, 5 family meals/week) during adolescence were significantly associated with reduced odds of overweight or obesity ten years later in young adulthood as compared with never having family meals as an adolescent. Interactions by race indicated that family meals had a stronger protective effect for obesity in black versus white young adults.

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Nonstandard Abbreviations: Project EAT-I and Project EAT-III (Eating and Activity in Teens)

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Conclusions—Family meals during adolescence were protective against the development of overweight and obesity in young adulthood. Professionals who work with adolescents and parents may want to strategize with them how to successfully carry out at least one to two family meals per week in order to protect adolescents from overweight or obesity in young adulthood.

Keywords

Family Meals; Adolescents; Overweight; Obesity; Longitudinal

Family meals have been suggested as one potential factor that may be protective against obesity (1-3). Higher frequency of family meals are associated with more consumption of fruit and vegetables (4-6), calcium and whole grains (7-9), lower levels of extreme weight control behaviors and binge eating (8, 10), and better psychosocial health in adolescents (11). These significant associations have held across diverse ethnic/racial backgrounds and sex. However, research examining the association between family meal frequency and adolescent Body Mass Index (BMI) or weight status (i.e., overweight, obese) has shown inconsistent findings (12-22).

To date, the majority of research looking at the association between family meals and adolescent overweight/obesity has primarily been cross-sectional and found mixed results. More specifically, some cross-sectional studies have shown an inverse relationship between the frequency of family meals and adolescent BMI (12-17), and others have shown no association (19, 20, 23, 24). Furthermore, these cross-sectional findings have often been specific to one sex (22) or age group (18, 22), race/ethnicity (18), or social class (18, 22). A meta-analysis also noted the limitations of studies described above and further identified that research has mostly been conducted with children (ages 6-12 years) rather than adolescents (ages 13-18 years) or young adults (ages 18 years and older).

Given the high prevalence of adolescent obesity in the US (25, 26), and the likelihood of obesity tracking into adulthood (27), it is important to identify modifiable factors in the home environment that can protect against overweight/obesity through the transition to adulthood. Identifying whether race/ethnicity modifies the association between family meal frequency and young adult overweight/obesity is important in order to identify whether certain groups benefit more from having family meals. The current study addresses these gaps and furthermore examines an important developmental time frame, transitioning from adolescence to young adulthood, which is a common time to gain weight and to have fewer family meals (28).

The main aim of this study is to use longitudinal data from a 10-year population-based study (Project EAT-III) with racially/ethnically and socioeconomically diverse adolescents to investigate whether having frequent family meals as an adolescent is protective for overweight and obesity in young adulthood. Additionally, interactions were examined in order to identify whether associations between family meal frequency in adolescence and overweight/obesity status in young adulthood differ by race/ethnicity. The specific hypotheses for the study are that higher family meal frequency during adolescence will predict lower odds of overweight and obesity longitudinally into young adulthood and race/ethnicity will modify this significant association.

Methods

Data were drawn from the first and third waves of a 10-year longitudinal cohort study designed to examine weight-related variables (eg, dietary intake, physical activity, weight control behaviors, weight status) among adolescents; Project EAT-I and Project EAT-III (Eating and Activity in Teens)(29). The EAT III sample includes participants (n=2,287) who responded to the 10-year follow-up survey. At baseline (ie, Project EAT I), middle school and high school students in 31 public schools in the Minneapolis/St. Paul metropolitan area of Minnesota completed anthropometric measures and surveys in class during the 1998-1999 academic school year. The 10-year follow-up (ie, EAT III) study was designed to follow-up on the original participants in 2008-2009 as they progressed from adolescence into emerging adulthood. Data collection for EAT III ran from November 2008 to October 2009 and was conducted by the Health Survey Research Center in the School of Public Health at the University of Minnesota, Minneapolis. The Institutional Review Board Human Subjects Committee at the University of Minnesota approved all protocols used in Project EAT at each time point.

Of the original Project EAT-I participants (n=4,746), 27.5% (n=1,304) were lost to follow-up primarily for missing contact information at Time 1 (n=411) and no address found at follow-up (n=712) (30). For Project EAT-III, survey invitation letters were sent to participants with a web address and a unique password for completing the online version of the Project EAT-III survey. Participants were able to select an option to be sent a paper version of the survey. Nonresponders were sent three reminder letters. All reminder letters included a postage-paid card for requesting paper copies. The second reminder letter additionally included paper copies of the survey. In addition, reminder postcards were sent to participants who did not complete the survey after logging into the online version or who requested paper copies at some point in the process. Internet tracking services were employed to identify correct addresses when mailings were returned due to incorrect addresses.

A total of 1,257 females and 1,030 males completed Project EAT-III surveys that were determined to be valid and adequately complete for inclusion in analyses. This represented 66.4% of participants who could be contacted (48.2% of the original school-based sample). The majority (86.5%) of survey respondents completed the online survey. One third of participants (29.9%) were in middle school at baseline (mean age = 12.8±0.7 years) and were in emerging young adulthood (mean age = 23.2±1.0 years) at follow-up. Two thirds of participants (70.1%) were in high school at baseline (mean age = 15.9±0.8 years) and were in young adulthood (mean age = 26.2±0.9 years) at follow-up (31).

The Project EAT survey was developed at baseline and revised for use at 10-year follow-up specifically to assess items of relevance to young people as they transitioned into young adulthood and developed more independent lifestyles. The survey is a 221-item survey assessing a range of socio-environmental, personal, behavioral, and familial factors of potential relevance to nutritional health and obesity among adolescents. The survey development is described elsewhere(29). Two-week survey test-retest reliability data were

collected from 167 adolescents at baseline and validity of the survey was established and details are previously published(29).

To assess family meal frequency, the exposure variable, adolescents were asked, “During the past seven days, how many times did all, or most, of your family living in your house eat a meal together?” Response options included: never, 1-2 times, 3-4 times, 5-6 times, 7 times, and more than 7 times (Test-retest $r=.83$).(32) Although this measure is a single item, it has been used in the majority of prior studies looking at family meal frequency,(33-35) thus increasing the ability to compare results across studies. It has also been shown to be reliable and valid with diverse populations (7) (32). The three highest categories were collapsed to allow for meaningful comparisons between parents who had infrequent or occasional family meals with families who had more regular family meals (36).

To assess overweight and obesity status, the outcome variable, self-reported height and weight values were used to calculate body mass index (BMI) [(weight(kg)/height(m²)] at baseline and 10-year follow-up. At baseline, high correlations were found between self-reported and measured BMI in male ($r=0.88$) and female ($r=0.85$) adolescents (37). Additionally, at EAT III very high correlations between self-reported and measured BMI were found in a validation subsample of 63 male and 62 female EAT-III study participants ($r=0.95$ for males and $r=0.98$ for females). At baseline, overweight status was determined based on a BMI at or above the 85th percentile for sex and age using reference data from the Centers for Disease Control and Prevention (38). Weight status at 10-year follow-up was defined according to current BMI guidelines for adults (overweight: BMI 25 and < 30 kg/m²; obese: BMI ≥ 30 kg/m²) (39).

Control variables included sex, age, race/ethnicity and socioeconomic status. These variables were assessed by self-report at EAT I. Race/ethnicity was assessed with one survey 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 apply. Those reporting more than one response were assigned to the category “mixed/other” background. As few participants identified their background as “Hawaiian or Pacific Islander” or “Native American,” these youth were also included in the category “mixed/other.” Classification tree methodology (40) was used to generate five categories of Socioeconomic status (SES; Low SES, Low-Mid SES, Middle SES, Mid-High SES, High SES)(41). The prime determinant of SES was the higher education level of either parent. Subsidiary variables were family eligibility for free/reduced-price school lunch, family receipt of public assistance, and parent employment status.

The analytic sample ($n=2117$) for the current study excluded women who were pregnant at follow-up ($n=90$) and individuals who did not have self-reported BMI measurement at baseline or 10-year follow-up ($n=63$) or did not respond to the family meal frequency question at baseline ($n=17$). For each level of baseline family meal frequency (i.e., never, 1-2, 3-4, 5 or more), the proportion of individuals who were overweight or obese at 10-year follow-up was calculated. Logistic regressions of overweight and obese status at 10-year follow-up predicted by baseline family meal frequency controlling for sex, age, race, SES,

and baseline overweight or obese status were conducted to generate ORs of the effect of family meal frequency on overweight and obesity status 10 years later. Tests for interaction were performed between family meal frequency and each of the following: sex, age cohort (younger/older), race/ethnicity, and baseline overweight status. Only the interaction with race was significant and thus results are additionally presented stratified by race/ethnicity. All analyses were performed in 2012 using SAS (V9.2, Cary NC, 2011) and incorporating non-response sampling weights. Tests were considered statistically significant when p-values were less than .05. 95% confidence intervals are given for all odds ratios.

Because attrition from the baseline sample did not occur at random, in all analyses, the data were weighted using the response propensity method (42). Response propensities (i.e., the probability of responding to the Project EAT-III survey) were estimated using a logistic regression of response at 10-year follow-up on a large number of predictor variables from the Project EAT-I survey. Weights were additionally calibrated so that the weighted total sample sizes used in analyses for each sex cohort accurately reflect the actual observed sample sizes in those groups. The weighting method resulted in estimates representative of the demographic make-up of the original school-based sample, thereby allowing results to be more fully generalizable to the population of young people in the Minneapolis/St. Paul metropolitan area. Specifically, the weighted sample was 48.4% white, 18.6% African American, 19.6% Asian (primarily Hmong), 5.9% Hispanic, 3.3% Native American, and 4.2% mixed or other race/ethnicity. The sample was well-distributed across the five categories of socioeconomic status: 18.0% low, 19.0% low-middle, 26.2% middle, 23.3% upper-middle, and 13.5% high. Respondents with 10-year follow-up data included in analyses were more likely to be female, higher SES, White, and from the older cohort than those not included, but these differences were eliminated through the use of non-response weighting. After weighting there were no differences in baseline weight status between responders and non-responders. However, even after weighting for non-response and controlling for demographics, respondents had on average lower family meals at baseline than non-respondents (3.5 meals per week vs 3.9, p-value <.001).

Results

Table I shows the proportion of young adults who were overweight at 10-year follow-up by each baseline level of family meal frequency (i.e., never, 1-2, 3-4, 5 or more). At 10-year follow-up, 51% of the sample was overweight and 22% were obese. Among adolescents who reported that they never ate family meals together (15% of the sample) at baseline, 60% of them were overweight at 10-year follow-up and 29% were obese. In comparison, among adolescents who reported that they ate 1-2, 3-4, or 5 or more family meals together at baseline, 47-51% of them were overweight at 10-year follow-up and 19-22% were obese.

Table II shows adjusted (adjusted for baseline demographic characteristics and overweight or obese status) odds ratios and 95% confidence intervals for 10-year follow-up overweight and obese status by baseline family meal frequency. Overall, all levels of baseline family meal frequency (ie, 1-2, 3-4, 5 or more per week) during adolescence were significantly associated with reduced odds of overweight 10-years later in young adulthood compared with never having family meals during adolescence. In addition, 3-4 and 5 or more family

meals per week during adolescence were significantly associated with reduced odds of obesity 10-years later in young adulthood compared with never having family meals during adolescence. For example, the OR of 0.55 in Table II indicates that adolescents who had 1-2 family meals at baseline had 45% decreased odds of being overweight 10-years later as young adults compared with young adults who never had family meals as adolescents (baseline). Additional post-hoc tests did not find any significant differences between the different levels of family meal frequency (ie, 5 or more meals did not show any improvement compared with 3-4 meals).

A significant interaction between family meal frequency and race was found when predicting odds of obesity at 10-year follow-up (Likelihood ratio test for interaction = 28.5, d.f. = 5, $p < .0001$). The interaction indicated that the strongest protective effect of increasing family meal frequency during adolescence on obesity was among Black young adults. Specifically, Black adolescents who had 1-2 family meals vs Never (OR=0.60; CI=0.49-0.73), 3-4 family meals vs Never (OR=0.30; CI=0.19-0.47), or 5 or more family meals vs never (OR=0.15; CI=0.07-0.31) had reduced odds of obesity as young adults. No significant associations were found between family meals and obesity in any of the other races in stratified analyses, and no interaction between race and family meals was found when considering overweight status as the outcome rather than obesity.

Discussion

Overall, results from the current study suggest that having family meals as an adolescent is protective for young adult overweight and obesity 10 years later. All levels of family meal frequency (ie, 1-2, 3-4, 5 or more) were protective for young adult overweight compared with never having family meals. Additionally, 3-4 and 5 or more family meals per week were protective for young adult obesity compared with never having family meals. This study lends support to previous limited research on family meals that has shown family meal frequency is inversely associated with adolescent overweight/obesity (12-17). Furthermore, results from the current study extend prior research by showing that having family meals in adolescence is protective for overweight/obesity longitudinally into young adulthood.

Our results also indicated a stronger protective effect of family meal frequency on obesity among Black young adults compared with White young adults. This finding supports previous results showing differences in the benefits (eg, healthful dietary intake, weight status) of family meals by race/ethnicity (not protective for Hispanic boys) (43). However, due to the limited overall significant interactions by race/ethnicity, sex, SES, and age in the current study, results suggest that family meals may be protective for adolescents across all race/ethnicities, sex, age, and SES status.

There are several potential mechanisms that may explain the protective association between family meal frequency and young adult overweight/obesity. First, it may be that family meals are healthier than other meals because it is common to serve fruits and vegetables during the meals.(44) Additionally, family meals may provide opportunities for emotional connection among family members, creating a supportive environment for emotion regulation and a sense of security that gives children the ability to regulate their own eating

behaviors in their day-to-day lives.(45) Third, parental modeling of healthful eating behaviors and recognizing satiety cues may also be occurring at family meals.(46) Thus, it would be important for future research to examine further the potential mechanisms behind the results found in the current study such as looking at the emotional atmosphere at the meal, the quality and quantity of food served, and modeling behavior that occurs during family meals. Furthermore, although it is unclear why having only 1-2 family meals per week was protective for adolescents, it may be the case that the routines/patterns and associated benefits of family meal patterns (ie, supportive environment, connection) established in childhood carry forward into adolescence and young adulthood. For example, if families have frequent family meals with their young children (eg, 4-5 per week), by the time their child reaches adolescence—and they have to reduce meal frequency due to activities or work schedules—the benefits and protective nature of family meals may be sustainable because of previously exerted efforts.

Informing parents that even having one to two family meals per week may protect their child from overweight or obesity in young adulthood would be important.(47) Results from the current study may also help bolster the evidence-base for pushing efforts forward to create workplace policies and procedures that allow for parents to have more flexible hours, benefits for less than full time employment, and providing employees greater control over where and when their work is done in order for families to have more frequent family meals. (47) The findings from the current study may also be useful for informing future research on family meals. For example, it would be important to understand more about the potential mechanism(s) contributing to the association between family meal frequency and reduced risk of overweight/obesity in young adults (eg, the context and emotional atmosphere of the family meal, the content of conversations at the meal, who is present at the meals, distractions such as TV, texting or electronic tablets/games that may moderate the protective influence of family meals) (48).

One limitation of the study includes self-reported BMI. Although a validity sub-study was conducted with these adolescents and self-reported BMI and objectively measured BMI were highly correlated, it is still preferable to have objectively measured weight and heights. Additionally, the generalizability of study findings may be limited as all the baseline data were collected in the Minneapolis/St. Paul area of Minnesota. Furthermore, frequency of family meals was differentially reported by responders vs. non-responders to the EAT survey (3.7 vs. 3.9 meals per week respectively). However, because responders to the project EAT survey were more likely to eat fewer family meals on average than non-responders, current analyses focus on families who may have adolescents at higher risk of obesity. Thus, results are able to speak to protective factors for this at-risk population. Finally, this study was not able to address why having family meals was protective for adolescence. Examining the quality (ie, emotional atmosphere, interpersonal interactions) of family meals would be an important next step to potentially provide more details regarding why family meals are protective and how they function on a day-to-day basis so more families can take advantage of the protective nature of family meals.

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Table 1
Percent overweight or obesity at 10-year follow-up by frequency of family meals at baseline

	% (n) Family meal frequency at baseline	% (n) Overweight (BMI 25 <30 kg/m ²) at 10-year follow-up by family meals at baseline	% (n) Obese (BMI ≥30 kg/m ²) at 10-year follow-up by family meals at baseline
Overall Sample	100% (n=2117)	51% (n=1070)	22% (n=458)
Family Meals Frequency:			
Never	15 (310)	60 (187)	29 (91)
1-2	19 (413)	47 (196)	22 (89)
3-4	22 (475)	51 (242)	19 (91)
5 or more	43 (920)	49 (446)	20 (187)

Table 2
Odds ratios^a of young adult overweight status or obesity at 10-year follow-up

	10-year follow-up Overweight (BMI 25 <30 kg/m ²) Odds Ratio	95% Confidence Interval (CI)	10-year follow-up Obese (BMI ≥30 kg/m ²) Odds Ratio	95% Confidence Interval (CI)
Family Meal Frequency at Baseline:				
Never	Reference		Reference	
1-2 vs. Never	0.55	0.38-0.79	0.67	0.44-1.02
3-4 vs. Never	0.60	0.42-0.85	0.50	0.33-0.76
5 or more vs Never	0.63	0.46-0.87	0.68	0.47-0.99

^aOdds ratios and 95% confidence intervals from logistic regression controlling for baseline gender, age, race, SES, and overweight or obese status.

Bolded numbers indicate statistical significance at $p < 0.05$.