What Mediates the Relationship Between Family Meals and Adolescent Health Issues?

Debra L. Franko
Northeastern University

Sandra G. Affenito
St. Joseph College

Ruth H. Striegel-Moore
Wesleyan University

Objective: To determine whether the frequency of family meals in childhood is associated with positive health outcomes in adolescence through the mediating links of increased family cohesion and positive coping skills. Design: Data were obtained from the National Heart, Lung, and Blood Institute (NHBLI; HL/DK71122) and contract HC58023-26 and cooperative agreement U01-HL-48941-44. Participating NGHS centers included the following: Children's Medical Center, Cincinnati, Ohio; Stephen R. Daniels, MD, (principal investigator) and John A. Morrison, PhD (co-investigator); Westat, Inc., Rockville, Maryland; George B. Schreiber, ScD (principal investigator) and Ruth Striegel-Moore, PhD (co-investigator); and University of California, Berkeley, California: Zak I. Sabry, PhD (principal investigator) and Patricia B. Crawford, DrPH, RD (co-investigator). Maryland Medical Research Institute, Baltimore, Maryland: Bruce A. Barton, PhD, (principal investigator) and Ruth Striegel-Moore, PhD, (co-investigator) served as the data coordinating center. Program office was NHLBI: Eva Obarzanek, PhD, MPH, RD (project officer 1992-2007) and Gerald H. Payne, MD (project officer 1985–1991).

We acknowledge with gratitude the long-term commitment of all NGHS participants and their families who contributed to this study and the NGHS study personnel for their dedication to the project.

Correspondence concerning this article should be addressed to Debra L. Franko, Department of Counseling and Applied Educational Psychology, Northeastern University, 203 Lake Hall, Boston, MA 02115-5000. E-mail: d.franko@neu.edu

Familial variables are known to influence child and adolescent health concerns, including nutrition, physical activity, and substance use (Kiesner & Kerr, 2004; Resnick, Harris, & Blum, 1993). Eating together as a family ("family meals") may be one component of family life associated with positive health outcomes. More specifically, investigators have found that frequent family meals are associated with better nutrition and reduced risk of unhealthy weight control behaviors, substance use, teenage sexual intercourse, and suicidal risk (Borowsky, Ireland, & Resnick, 2001; Fulkerson et al., 2006; Kingon & O’Sullivan, 2001; Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003; Tepper, 1999). Taveras and colleagues (Taveras et al., 2005) reported that eating dinner together as a family was related to overweight prevalence at study entry but was not associated in longitudinal analyses of their data. In a single-wave survey of 4,746 middle and high school students (ages 11–18), frequency of family meals was evaluated by asking how many times over the previous 7 days did all or most of the family eat a meal together. After controlling for factors including family connectedness and demographics, girls reporting more frequent family meals exhibited reduced substance use (cigarettes, alcohol, and marijuana), higher grade point average, fewer depressive symptoms, and decreased risk of a suicide attempt (Eisenberg, Olsen, ...
Neumark-Sztainer, Story, & Bearinger, 2004), as well as less extreme weight control behaviors and chronic dieting (Neumark-Sztainer, Wall, Story, & Fulkerson, 2004).

It should be noted that the literature to date has not addressed the issue of directionality between family meals and positive outcomes. Although it is hypothesized that eating together as a family results in beneficial health behaviors, an alternate possibility is that families in which children are already doing well are more likely to have meals together. The causal direction can only be definitively assessed in an experimental design; because this would be difficult to do, the second best approach is to examine longitudinal data using predictive models, recognizing that there may be other (unmeasured) factors that might explain the positive outcomes.

The aim of this study was to examine the prospective relations between family meals and health outcomes and, further, to explore the mechanisms that might explain how family meals exert this positive impact. Eisenberg et al. (2004) suggested a number of possible mechanisms, including increased family communication, time spent together, or parental modeling of coping skills. It is possible that frequent family meals might influence later health outcomes by promoting healthful skills and attitudes. For example, family meals may lead to improved coping skills due to discussions of how to solve everyday problems. In turn, improved coping skills may lead to positive outcomes, for example, healthier eating, decreased depressive symptoms, and less substance use. Improved skills and attitudes are a “mediator” that links family meals with later health outcomes.

The literature on family communication, connectedness, and cohesion appears to support this assertion, particularly in the areas of mental health concerns (Compton, Thompson, & Kaslow, 2005; Garrison et al., 1997) and problematic eating behaviors (e.g., binge eating, restrictive dieting), including clinical eating disorders (Cooper, Whelan, & Woolgar, 2004; Gardner, Stark, Friedman, & Jackson, 2000; Rodriguez Martin, Novalbos Ruiz, Martinez Nieto, Escobar Jiménez, & Castro de Haro, 2004). In a study of adolescent girls using unhealthy weight control practices (e.g., extreme dieting, vomiting, laxative use), family connectedness, positive family communication, parental supervision/monitoring, and maternal presence were found to be protective factors against these unhealthy behaviors (Fonseca, Ireland, & Resnick, 2002). Rodriguez Martin et al. (2004) found that family dysfunction was associated with higher scores on multiple subscales of the Eating Disorder Inventory (EDI; Garner, Olmstead, & Polivy, 1983) in a group of adolescents with anorexia nervosa and bulimia nervosa.

Capitalizing on longitudinal data collected in the 10-year National Heart, Lung, and Blood Institute Growth and Health Study (NGHS) that assessed family meals in childhood and health outcomes in adolescence, we examined potential mediators that might explain the mechanisms by which family meals exert their impact. We tested the hypothesis that the frequency of family meals in childhood would be associated with positive health outcomes in adolescence through the mediating links of increased family cohesion (e.g., better communication and more time together) and positive coping skills (see Figure 1).

**Method**

The NGHS was a 10-year longitudinal study of 2,379 black and white girls who were 9 or 10 years old at study entry (National Heart, Lung, and Blood Institute [NHBLI], 1992). NGHS was specifically designed to investigate the development of overweight and cardiovascular disease risk factors in black and white girls; no other racial or ethnic minority groups were included by design, and boys were not studied. Girls were recruited from three study sites: University of California at Berkeley, University of Cincinnati/Cincinnati Children’s Hospital Medical Center, and Westat, Inc./Group Health in Rockville, Maryland. Girls were interviewed annually between Study Year 1 and Study Year 10; girls’ mean ages were 9.5, 10.5, 11.5, 12.5, 13.5, 14.5, 15.5, 16.5, 17.5, and 18.6 years from Study Years 1 through 10, respectively. Retention was high in Years 2–4 (96%, 94%, 91%), declined to 82% in Year 7, and increased to 89% in Year 10. Eligibility criteria to participate in NGHS included the following: (a) child and parents indicated that they were either white or black; (b) girls were within 2 weeks of age 9 or 10 years; (c) child gave assent; and (d) parents gave consent and completed a household demographic sheet. Parental education was categorized as 4 or more years of college versus less than 4 years of college. Education was chosen over income as a proxy of socioeconomic status, because NGHS data were collected in three regions differing in median household income and also because previous research has shown that education is a better predictor of health-related outcomes than income.

![Figure 1](image-url)  
**Figure 1.** Time of measurement and hypothesized relations examined in the present study.
Participants’ age was recorded as age at last birthday. Data from all participants \((N = 2,379)\) were included in the current study. Most measures were given in alternating years (Years 1, 3, 5, 7) to reduce subject burden.

**Measures**

As shown in Figure 1, the analysis was designed to test the hypothesis that the frequency of family meals in childhood (Study Years 1 and 3) would be related to health outcomes (Study Year 10) through the mediating links of family cohesion and coping skills (Study Years 7/8), after adjusting for baseline (Year 1) demographics as well as previous levels of the outcome variables (Years 5/6). Measures collected during these specific study years were used to capture the time series of events shown in Figure 1 and to permit adjustment for levels of dependent variables at earlier time points. All mediators and outcomes used in this analysis were measured in alternating study years, some in even-numbered years and others in odd-numbered years; for this reason, in some cases it was necessary to combine multiple years (2/3, 5/6, and 7/8) to represent blocks of time. Specifically, the family meals measure was based on 2 study years of data (Years 1 and 3, not measured in Year 2) to indicate both the temporal stability and the frequency of family meal patterns. The mediators were measured in Year 7 (family cohesion) or 8 (coping), with the same measures at Years 3 or 2 (respectively) used as adjustment variables. The outcomes were all measured in Study Year 10, with the same measures at Years 5 (EDI subscales) or 6 (all other outcomes) used as adjustment variables.

**Demographics (obtained at Study Year 1).** Baseline demographics were race/ethnicity (non-Hispanic black or white, self-reported at study entry using US Census categories), parental education (completed 4+ years of college vs. less education), and number of parents in the household (two parents vs. one parent in the household).

**Family meals (obtained at Study Years 1–3).** In Study Years 1 and 3, girls were asked “How often do you eat with your parent(s),” with response options “usually/always,” “sometimes,” or “never or almost never.” The measure of family meals completed by the girls in the current study was validated by (a) comparison with a measure of family meals completed by a parent during the same time, and (b) comparison with other measures completed by the girls indicating solitary eating behaviors (reasoning that the frequency of family meals should be inversely related to frequency of solitary eating). These comparisons were made for the same years of the study as the years in which the measure of family meals was obtained (Years 1 and 3). A composite score was constructed across Years 1 and 3 for the parent measure and for each of the measures of solitary eating. These composite scores were then compared to the primary measure of family meals completed by the participants at the same point in time (Study Years 1 and 3).

The data indicated significant associations between the participant and parent measures of family meals. Specifically, the polychoric correlation coefficient (indicating the strength of association among ordinal variables) was 0.43 (SE = 0.04). The Mantel-Hanzel chi-square test of non-zero correlation among ordinal measures also indicated significant correspondence, \(\chi^2(1, N = 1279) = 108.80, p < .0001\). Furthermore, there were significant inverse correlations between the participant family meals question and the indicators of solitary eating (polychoric correlations ranging from -0.08, \(SE = 0.03\), for “I eat while I do my homework” to -0.31, \(SE = 0.03\), for “I eat alone”). Thus the assessment of family meals completed by the participants was strongly associated with parental report of family meals and was inversely associated with participant solitary eating behaviors.

**Mediators (Study Years 7/8, controlled for at Years 2/3).** In this study, three potential mediating variables were studied: family cohesion, problem-focused coping, and emotion-focused coping. To investigate family cohesion and coping skills as potential mediating factors, we used cohesion measured in Year 7 and coping measured in Year 8 (these measures were not collected in the same study years). To measure the girls’ perceptions of family cohesion, the Cohesion subscale from the Family Adaptability and Cohesion Evaluation Scale (FACES) III (Olson, Portner, & Lavee, 1985) was used; questions were worded slightly to be appropriate for children. Psychometric data presented by Olson et al. (1985) indicated test–retest reliability of 0.93 at a 5-week interval, and evidence of discriminant validity has been shown by low correlations between cohesion and adaptability \((r = .03)\) and cohesion and social desirability \((r = .35)\). In the NGHS sample, internal consistency, as measured by Cronbach’s alpha, was 0.82 in Study Year 3 and 0.89 in Study Year 7.

Two secondary subscales from the Coping Strategies Inventory (CSI; Tobin, Holroyd, & Reynolds, 1984) measured positive coping styles: problem-focused engagement and emotion-focused engagement. Tobin et al. (1984) reported that test–retest reliability over a 2-week period ranged from 0.67 to 0.83. Construct validity has been shown in several studies examining the relationship between the CSI and other coping and stress measures, and a hierarchical factor analysis found support for the structure of the CSI (Tobin, Holroyd, Reynolds, & Wigal, 1989). Cronbach’s alpha for each scale for Years 2 and 8 were as follows: problem-focused coping, 0.79 and 0.79; and emotion-focused coping, 0.84 and 0.90, respectively.

**Outcomes (Study Year 10, controlled for at Years 5/6).** Table 1 shows the outcome variables used in the present study and how they were coded. Stress was measured using the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983), a 14-item scale measuring the degree to which situations occurring in the previous month are appraised as stressful. Psychometric data on the PSS indicate that it is a reliable and valid measure. Test–retest reliability has been reported to be 0.85 over a 2-day interval (Cohen et al., 1983; Hershberger, 1990). Evidence of concurrent and predictive validity has been found between the PSS and depressive symptoms (0.76) as well as the PSS and physical symptoms (0.64; Cohen et al., 1983). In the NGHS sample, Cronbach alpha was 0.89 in Year 6 and 0.84 in Year 10.

Further, three subscales from the EDI (Garner et al., 1983) were included as outcome variables: drive for thinness (DT; 7 items), body dissatisfaction (BD; 9 items), and bulimia (7 items). Extensive data support the reliability and validity of this measure (Franko et al., 2004; Garner et al., 1983; Wear & Pratz, 1987). In the NGHS sample, Cronbach alphas for Years 5 and 10 were 0.88 and 0.92 for DT, 0.89 and 0.93 for BD, and 0.75 and 0.86 for bulimia, respectively.
In addition, participants were asked to report the number of days in the previous 30 days when they had consumed alcohol, engaged in extreme weight control behaviors, or smoked cigarettes.

### Statistical Analysis

To test the hypothesis that family cohesion and coping skills mediate the relation between family meals and outcomes, the analytic framework of Kraemer and colleagues was used (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001; Scott, Kraemer, Essex, & Kupfer, 2004). This framework may be viewed as a variant of the "causal steps" approach to analysis of mediation (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Mediation is inferred from a specific pattern of results across a series of regression models (the "causal steps") involving an outcome (O) and two possible risk factors (A and B). A separate model is created for each outcome and pair of risk factors. Although techniques such as path analysis or structural equation modeling would be possible alternative approaches, the framework of Kraemer et al. (2001) was chosen because it was specifically designed to address mediation in longitudinal data and thus was an excellent fit given the data and analytic objectives of the current study.

The framework defines mediation as follows. Assuming that A and B are two possible risk factors for outcome O, B mediates the association between A and O if and only if three conditions are met: (1) A occurs before B; (2) A and B are significantly associated with one another; and (3) in the regression model $O = A + B + A \times B$, either (a) there is a significant main effect of A as well as a significant main effect of B or a significant $A \times B$ interaction (partial mediation), or (b) there is a significant main effect of B and neither a significant main effect of A nor a significant $A \times B$ interaction (full mediation).

In the Part 1 models, mediators (B) were modeled as a function of family meals (A) represented as a three-category ordinal variable (always/usually, sometimes, never or almost never). Conceptually, this is similar to a nonequivalent groups design (Cook & Campbell, 1979) where frequency of family meals is analogous to a "treatment" that is not randomly assigned. Because there was no random assignment, the groups may differ in other ways besides the frequency of family meals. Therefore, all models reported in this article (Parts 1 and 2) were adjusted for study site, race, parental education and one- versus two-parent household. In addition, the Part 1 models were adjusted for the mediator measured in the same timeframe as family meals (i.e., Year 2 for coping and Year 3 for family cohesion) and the interaction between the latter and family meals, allowing us to assess prospective associations between family meals and mediators after adjusting for prior differences in the mediators.

In the second type of model (Part 2 models: $O = A + B + A \times B$), Year-10 outcomes served as the dependent variable (O) and the independent variables of interest were family meals (A; Years 1 and 3), mediators (B; Years 7/8), and the interaction between the two ($A \times B$). Each possible pair of mediators and outcomes was examined in a separate model. In addition to the specific mediator of interest in a given model, models were adjusted for the other two mediators. Also, the outcome measured in Year 5/6 was included in the model to estimate the association between a given mediator and outcome (Year 10), holding constant the outcome measured at a prior time. This allowed us to examine whether a given mediator was associated with differences in the outcome (Year 10) among girls who started out at the same level of the outcome (Years 5/6).
All Part 1 and Part 2 models were computed with PROC GENMOD in SAS v9.1 (SAS Institute, Cary, NC) with appropriate distribution and link functions depending on whether the outcome was continuous or binary. We predicted that frequency of family meals would be related to the mediators and the mediators would in turn be predictive of each of the outcomes at Year 10. Therefore, \( p < .05 \) was used as criterion of statistical significance for these main effects. Because no interactions were predicted, interactions were judged at a more conservative 0.01 level to reduce the possibility of Type I errors.

Effect sizes are expressed as \( r \), the coefficient of partial correlation, representing the marginal, additional association with an outcome attributable to a variable of interest in a model that already takes into account the association due to a set of adjustment variables (Neter, Wasserman, & Kutner, 1990; for categorization of outcomes, the coefficient was based on Nagelkerke, 1991). Rules of thumb for categorizing \( r \) (small, medium, large) are provided by Kraemer et al. (2003); for example, \( r < 0.3 \) is categorized as small.

Prior to analysis, all variables were center coded as described by Kraemer and Blasey (2004); continuous variables are centered on the median and binary variables are coded 0.5 versus –0.5, which enables the results (e.g., model coefficients) to be interpreted as estimates at average levels of the adjustment variables. As shown in Tables 1 and 2, for the analytic variables, missing data ranged from 0% (race) to 21% (family cohesion). Missing data were imputed in SOLAS (v. 3.20, Statistical Solutions Ltd., Saugus, MA) via hot decking. Briefly, each missing value was replaced by a nonmissing value from a randomly selected girl with a similar demographic profile; this method preserves the distributions of analytic variables including the variance (Allison, 2002). Results from analyses with missing data imputed via hot decking were compared with results from parallel complete case analyses (i.e., excluding participants with missing data on any variable) to ensure that the method of handling missing data did not have a major impact on the results. Unless noted otherwise, results reported in the following section are based on data following imputation.

### Results

**Family Meals (Years 1 and 3)**

Across Study Years 1 and 3, few girls (less than 7%) said that they “never or almost never” ate with their parents in either year; the modal pattern, accounting for slightly less than half of the girls, was “sometimes” in both years or “usually/always” one year and “sometimes” the other year. However, almost as many girls said that they “usually or always” ate with their parents in both years.

**Direct Effects of Family Meals on Outcomes**

Family meals was measured at Years 1 and 3, and the main outcome measures were measured at both Years 5/6 and Year 10. The results of the direct effects analysis are shown in Table 2. The means and percentages shown are adjusted for differences in study site, race, parental education, and number of parents in the household. Table 2 indicates that the associations are generally stronger when one looks at outcomes measured at Years 5/6 than at Year 10. There are direct effects at 5/6 and/or 10 for the following variables: stress; smoking; and drive-for-thinness, body dissatisfaction, and bulimia subscales of the EDI.

**Part 1 models: Association between family meals (Years 1 and 3) and hypothesized mediators (Years 7/8).** The first set of analyses focused on the Part 1 models used to estimate the association between family meals (A) and mediators (B). The mediators were family cohesion, problem-focused coping, and emotion-focused coping. As shown in Table 3, more frequent family meals (Study Years 1 and 3) were predictive of greater family cohesion and greater levels of problem- and emotion-focused coping (Years 7/8) (all \( p s < .0001 \)). For all mediators, eating family meals “some-
times” versus “never or almost never” was associated with estimated mediator increases between 0.42 and 0.58 points (depending on the specific mediator), whereas eating family meals “usually/always” was associated with additional mediator increases of 0.26 to 0.38 points in the mediators. The models controlled for prior assessments of the mediators; therefore, the mean differences shown in Table 3 are interpreted as differences in the mediators (e.g., family cohesion) at Years 7/8, with the corresponding mediator (e.g., family cohesion) held constant in prior years.

Part 2 models: Association between family meals (Years 1 and 3), mediators (Years 7/8), and outcomes (Year 10). The association of family meals with the mediators (Part 1 models) is a necessary but not sufficient condition for mediation as defined previously. For mediation, a specific pattern of results must also be observed in the Part 2 models (outcome = family meals + mediator + family meals x mediator).

Outcomes in Year 10 were modeled as a function of family meals (Years 1 and 3), mediators measured during Years 7/8, and interactions between the two. Because only the main effects and interaction are relevant to the mediation hypothesis, only these are described. Table 4 shows model coefficients representing the mediator main effects (linear slopes for continuous outcomes, odds ratios for binary outcomes).

There were significant main effects of family cohesion in the models of cigarette smoking and smoking daily. Specifically, higher levels of family cohesion in Years 7/8 were related to a reduced probability of any smoking in the previous 30 days as well as daily smoking in Year 10. The effect sizes were in the small range ($r = 0.12$ for daily smoking and 0.07 for any smoking). As an additional indicator of effect size, a 10% increase in the family cohesion scale predicted an 8.1% decrease in risk of smoking 1 or more days in the last 30 days and a 12.8% decrease in risk of smoking every day. These results from the Part 2 models, accompanied by the significant association between family meals and family cohesion (Part 1 models), are consistent with the hypothesis that problem-focused coping mediates the relation between family meals and these three outcomes (i.e., stress, EDI drive-for-thinness score, and EDI bulimia score). However, the presence of an interaction without either main effect suggests that problem-focused coping does not mediate the relation between family meals and smoking. Problem-focused coping was not significantly associated with any of the outcomes measured in Year 10.

Emotion-focused coping was not significantly associated with any of the outcomes. Thus, the analysis did not reveal evidence that emotion-focused coping mediates the relation between family meals and any of the outcomes measured in Year 10.

Parallel complete case analyses (excluding from the analysis participants with missing data for any variable) yielded results very similar to the analyses with missing data imputed via hot decking for most variables. The primary difference between the two methods of handling missing data was that variance estimates (standard errors, 95% confidence interval [CI]) tended to be slightly greater in complete case analysis (which is to be expected due to the reduced sample size in the latter), but this led to a difference in conclusions about the effects of interest in only one situation: For smoking, the estimated effect of family cohesion was significant with hot decking (odds ratio [OR] = 0.97, 95% CI = 0.95–1.00, $p = .02$) but not in complete case analysis (OR = 0.97, 95% CI = 0.94–1.00, $p = .08$).

Table 3

<table>
<thead>
<tr>
<th>Mediator (Years 4–9)</th>
<th>Frequency of family meals (combined pattern, Years 1 and 3)</th>
<th>$N = 2379$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never or almost never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Family cohesion (FACES)</td>
<td>21.84 (0.39)</td>
<td>22.27 (0.17)</td>
</tr>
<tr>
<td>Problem-focused coping</td>
<td>13.82 (0.28)</td>
<td>14.24 (0.13)</td>
</tr>
<tr>
<td>Emotion-focused coping</td>
<td>14.48 (0.37)</td>
<td>15.06 (0.17)</td>
</tr>
</tbody>
</table>

$^a$ The table shows means by frequency of family meals, after adjustment for site, race, parental education, one- vs. two-parent household, the mediator measured in Year 2 or 3, and the interaction between the latter and family meals. $^b$ Likelihood-ratio chi-square test of the main effect of family meals in the model with the potential mediating factor as the dependent variable, adjusting for the variables listed in the previous note. $^c$ Effect size estimates are expressed as $r$, the coefficient of partial correlation, interpreted as the marginal contribution of family meals to prediction of the corresponding mediator, after accounting for the effects of race, study site, parental education, and number of parents in the household. One rule of thumb is that $0 \leq |r| < 0.30$ indicates a “small” effect.
**Discussion**

Family meals appear to be associated with a variety of child-
hood and adolescent positive health behaviors (Mamun, Lawlor, O’Callaghan, Williams, & Najman, 2005). This study sought to increase our understanding of factors that mediate this relationship by investigating how family meals might foster adolescent health. Eating meals with parents was a common occurrence for girls ages 9–12, with fewer than 10% reporting that they “never or almost never” ate with their parents during both study years. Furthermore, girls who ate with their parents more often in Study Years 1 and 3 exhibited higher levels of family cohesion and problem- and emotion-focused coping in Years 7/8, even after adjusting for these mediators measured concurrently with family meals (Years 2/3). This finding suggests that frequent family meals foster closer family ties and may be helpful in teaching children coping skills. Our data are consistent with Fulkerston, Neumark-Sztainer, and Story (2006), who found associations between a positive atmosphere and frequency of family meals, suggesting that family meals may enhance family communication and provide good role modeling.

Girls who exhibited greater family cohesion (Years 7/8) had a lower risk of smoking one or more times in the previous 30 days as well as daily smoking (Year 10), even after adjusting for frequency of smoking in earlier years (Year 5/6). Along with the significant association between family meals and family cohesion, this is consistent with the hypothesis that family cohesion mediates family meals (Years 1 and 3) and risk of occasional and daily smoking in Year 10. In addition, girls who exhibited higher levels of problem-focused coping in Years 7/8 exhibited lower levels of stress, drive for thinness, and bulimic symptoms in Year 10; the evidence suggests that problem-focused coping mediates the relation between family meals and variables measuring stress, drive-for-thinness, and bulimia scores. Taken together, these findings are consistent with the possibility that family meals positively impact these adolescent health behaviors through two specific mechanisms—family cohesion and problem-focused coping.

Family cohesion is characterized by a feeling of closeness among family members, enjoyment of family activities, and a style of decision making in which all family members feel involved (Olson et al., 1985). Family cohesion likely helps girls feel more connected to family members and willing to turn to them when dealing with adolescent concerns. Smoking was less likely to occur in families who ate together and were high in cohesiveness. This finding suggests that family cohesion may help adolescents to make better choices in regard to their health behavior, at least in relation to tobacco use. Studies have consistently found that parental behaviors in regard to smoking (e.g., parental use), as well as attitudes, can influence adolescent smoking patterns (Chassin et al., 2005; Maurer, Brunson, & Pleck, 2003). Our data suggest that family meals in childhood, mediated by levels of family cohesion, had a protective impact on adolescent smoking behavior. Whether this occurs because health issues are discussed during family meals, or because greater cohesion is linked in general with more healthful parental/familial behaviors, is not known. However, our data do suggest that parents should be encouraged to eat with their young children on a regular basis, as such interactions may positively influence risky behavior that is not likely to occur for many years later.

The association between problem-focused coping and reduced levels of stress and drive-for-thinness and bulimic symptoms suggests positive effects of dealing with problem situations actively (Koff & Sangani, 1997). By addressing problems “head on,” girls may experience less stress than if problems are internalized. Drive-for-thinness and bulimic symptoms may reflect aberrant, internalized ways of dealing with societal pressures to maintain a certain body shape or weight (Rowe, Pickles, Simonoff, Bulik, & Silberg, 2002). Girls with a tendency to use problem-focused coping may use more healthy ways of dealing with these societal pressures. Alternatively, family meals may provide the opportunity for girls to see positive coping modeled by parents (taking action to solve problems).

There was no evidence that emotion-focused coping mediated the relationship between family meals and outcomes measured in

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**Table 4**

Modeled Association Between Potential Mediating Factors and Outcomes

<table>
<thead>
<tr>
<th>Outcomes (Year 10)</th>
<th>Mediator measured in Years 7/8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Family cohesion</td>
</tr>
<tr>
<td>Stress</td>
<td>−0.06 (0.03)</td>
</tr>
<tr>
<td>Extreme dieting</td>
<td>0.97 (0.93–1.00)</td>
</tr>
<tr>
<td>Drink alcohol</td>
<td>0.99 (0.97–1.00)</td>
</tr>
<tr>
<td>Smoke cigarettes</td>
<td>0.97 (0.95–1.00)**</td>
</tr>
<tr>
<td>Smoke daily</td>
<td>0.95 (0.93–0.98)**</td>
</tr>
<tr>
<td>Drive for thinness</td>
<td>−0.02 (0.02)</td>
</tr>
<tr>
<td>Body dissatisfaction</td>
<td>−0.05 (0.03)</td>
</tr>
<tr>
<td>Bulimia</td>
<td>0.01 (0.01)</td>
</tr>
</tbody>
</table>

Note. The table displays hypothesis test results (indicated by asterisks) and effect size indicators (beta coefficients and standard error for continuous outcomes or odds ratios and 95% confidence interval for binary outcomes). FACES = Family Adaptability and Cohesion Evaluation Scale.

a Example of interpretation (continuous outcome): For each 1-point increase on the problem-focused engagement scale, girls’ stress scores are estimated to decrease by 0.25 points, after adjustment for the other variables included in the analysis.

b Example of interpretation (binary outcome): After adjustment for the other variables included in the analysis, for each 1-point increase on the FACES scale, the estimated odds of smoking cigarettes is 0.97 times as great; or equivalently, for each 1-point increase in FACES, the estimated odds of not smoking increases by 1/0.97 = 1.03.

Main effect of potential mediator. p < 0.05. **p < .01. ***p < .001. ****p < .0001.
Year 10. This may be related to the fact that our outcomes were more problem specific (e.g., smoking) than emotional in nature (e.g., how to deal with negative affect). Alternatively, discussions at family meals may focus more on action-oriented problem solving rather than appropriate expressions of emotions in the face of adversity.

It is interesting that we did not find some of the relationships between family meals and outcomes that were observed in previous studies with cross-sectional samples, particularly extreme weight control behaviors (e.g., vomiting and laxative use; Neumark-Sztainer et al., 2004) and alcohol use (Eisenberg et al., 2004). This is not surprising given that concurrent associations between family meals and outcomes are likely to be stronger than prospective relations; in our study, there was a large gap in time between measurement of family meals (Years 1–3) and outcomes (Year 10). Furthermore, adjusting for earlier levels of the outcomes (Years 5/6) forced us to model differences among girls who started at the same level of the outcome, which means there is less variation among girls to explain than there is when such controls are absent. This study, unlike prior studies, provided stronger evidence that the frequency of family meals led to positive outcomes and not vice versa.

Limitations of this study are related to the sample composition, which does not allow us to assess the impact of family meals on boys or on individuals with other demographic characteristics (e.g., Hispanic families). The reliance on self-reported data may also have biased the results in that children might be inclined to provide “desired” responses to questions. It is also possible that children answered positively to the family meals question in situations that might not be ideal (e.g., eating together as a family in the car while driving to soccer practice). However, our validation analyses suggested that children did respond to the question in the spirit in which it was asked, that is, sitting down together and eating a meal with family. In the future, a more detailed assessment of family meals would provide a fine-grained and complete picture of the associations. Nevertheless, a single question assessing the frequency of family meals was found to be significantly related to adolescent health, mediated by family cohesion and coping skills. Two final limitations related to the number of tests run on this large sample, which increased the risk of Type I errors and the imputation of missing data. To reduce the likelihood of making Type I errors, an alpha level of 0.01 was used for all associations that were not predicted a priori based on past literature; however, this does not guarantee that Type I errors were not made. The results should be viewed as hypothesis generating, and further confirmation should be sought in future studies. A growing literature on the effects of methods for handling missing data (see Allison, 2002, for a review) consistently shows that when data are missing, simply dropping cases with missing data (complete-case analysis) often leads to biased estimates. Furthermore, estimates based on techniques such as multiple imputation and hot decking are less subject to bias, and some studies indicate that hot decking can be especially advantageous (Tang, Song, Belin, & Unutzer, 2005). In this study, complete-case analysis was compared with hot decking and the results differed in only one case (i.e., the association between family cohesion and smoking).

We also note that the clinical significance of some of our findings is unclear. Due to the large sample size ($N = 2,379$), the study had excellent power to detect statistical associations between the variables of interest; however, the effect sizes were consistently small ($|r| \leq 0.14$). For example, the estimated coefficient for the association between problem-focused coping and the stress scale ($\beta = -0.25$, $SE = 0.05$) was highly significant from a statistical perspective ($p < .0001$), but this translated into a .25 decrease in stress for a 1-point increase in problem-focused coping. Given that stress scores ranged from 0 to 56 (Table 1), the clinical significance of this decrease is debatable. It is possible that large increases in problem-focused coping would be needed to produce clinically significant decreases in stress. Future work is needed to determine the practical significance of these associations and whether they predict meaningful differences in health and well-being.

An important strength of NGHS is the longitudinal nature of the data. To determine the causal effect of family meals, ideally one would randomize girls to family meal conditions in an experiment. Obviously, such an experiment would be difficult and potentially unethical to implement. The best alternative is to examine prospective relations between family meals and outcomes in a longitudinal sample where natural variation in frequency of family meals is observed. Although causality cannot be determined with certainty, at least the present study was able to provide evidence for a necessary (but not sufficient) condition of causality, namely that cause precedes effect in time (and effect cannot precede cause). Because girls were not randomized to family meal conditions, it was important to adjust for possible differences among groups as well as for the outcome variable at the prior time. As we were able to conduct these analyses, we can be more confident of the direction of the relations between variables. However, we cannot ultimately rule out the possibility of other variables (not measured) that might be causing the positive outcomes.

In sum, our findings indicate that several important adolescent health concerns, namely smoking, perceived stress levels, drive for thinness, and bulimic symptoms, were influenced by the frequency of family meals in childhood and mediated by family cohesion and coping styles. These data suggest that families should be encouraged to eat together from an early age, as such activity may have multiple benefits in later years when adolescent health issues become paramount.

References


MEDIATORS OF FAMILY MEALS


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