ABSTRACT

Objective: To confirm previously reported associations between family meal frequency and dietary intake, and to examine family cohesion as a potential mediator of this relationship.

Design: Cross-sectional observational study. Data collected at baseline via questionnaire.

Setting: Randomized, controlled household weight gain prevention trial.

Participants: Participants were 152 adults and 75 adolescents from 90 community households.

Variables Measured: Family meal frequency assessed with a single question. Perceived family cohesion measured by the Family Adaptability and Cohesion Evaluation Scale-III. Usual intake of targeted food items assessed with modified food frequency questionnaire.

Analysis: Hierarchical linear regression with mediation analysis. Statistical significance set at α-level .05.

Results: Family meal frequency was associated with intake of fruits and vegetables in adults, and sweets and sugar-sweetened beverages in adolescents. Family meal frequency was positively correlated with perceived family cohesion (r = 0.41, P < .01). Partial mediation by family cohesion was observed for family meal frequency and sweets intake in adolescents.

Conclusions and Implications: Results suggest that family cohesion is not a consistent mediator of relationship between family meal frequency and individual dietary intake. Future studies should assess additional plausible mediators of this relationship in order to better understand the effect of family meals on dietary intake.

Key Words: family meals, family cohesion, diet, mediation analysis (J Nutr Educ Behav. 2011;43:229-235.)

INTRODUCTION

Positive associations have been observed for family meals and diet quality, particularly among adolescents, in both cross-sectional1-4 and longitudinal5,6 studies. Despite these findings, there is no established theory to explain observed associations between family meals and dietary intake. Some researchers have suggested that family meals provide an opportunity for parents to model healthful eating behaviors or to make healthful food available to family members.7 Another possible explanation is that the frequency of family meals reflects the broader family social environment, whereby more frequent family meals are associated with better overall family functioning. One important dimension of family functioning is family cohesion, “the emotional bonding that family members have towards one another.”7 Too little or too much cohesion is thought to characterize a dysfunctional family,8 which may have negative implications for the adoption and maintenance of healthful behaviors, including healthful eating.

The perception of a cohesive family may be associated with healthful eating in a variety of ways, including increased acceptance of family rules and role modeling related to food choice, or the development of healthful attitudes and behaviors in general due to improved psychological well-being. Although family cohesion has been shown to mediate the effect of family meals on other adolescent health behaviors such as smoking,9 the indirect effect of family meals via family cohesion on food choice has not been reported in the literature. The authors are aware of only 2 studies that have directly examined the relationships between family meal frequency, family cohesion, and dietary intake. In their cross-sectional analyses of family cohesion and eating behaviors in 9- to 19-year-old girls, Franko and colleagues found that family cohesion was associated with more days of breakfast consumption and lower quantities of soda intake.10 Results also indicated a trend toward greater milk, fruit, and vegetable...
consumption as family cohesion increased. In subsequent longitudinal analyses, the authors found that greater frequency of family meals predicted an increase in family cohesion over time. These analyses suggest that family meals may influence family cohesion, which in turn is associated with diet quality, at least for girls.

Unfortunately, the relationship between family meals, family cohesion, and dietary intake is not clear. Elucidating the mechanism through which family meals have a positive influence on dietary intake may benefit interventionists seeking to improve diet quality within families. If family cohesion is found to be a mediator of family meals and dietary intake, health promoters can enhance dietary interventions by implementing strategies to improve family cohesion. If family cohesion is not indicated as a mediator of family meals and dietary intake, then it will be important to investigate other potential mediators to better understand how family meals influence dietary intake.

Previous research has largely focused on the influence of family meals on adolescents’ eating behaviors. The authors are aware of only 1 study to date that has reported on the relationship between family meal frequency and dietary intake among adults. Among a sample of 300 women, no association was observed between reported frequency of family meals and dietary intake. More research is needed to confirm the association between family meal frequency and dietary intake in adults, as well as to examine the possibility of family cohesion as a mediator of this relationship, if one exists. Improving the understanding of the influence of family meals on adults’ eating patterns, in addition to those of adolescents, is worthwhile because of the importance of diet quality and weight management for adults’ health.

This study examined the cross-sectional relationships between family meal frequency, family cohesion, and individual dietary intake. In light of previous findings, it was hypothesized that greater frequency of family meals would be positively associated with greater family cohesion in adolescents, and that the association between family meal frequency and individual food choice would be partially mediated by family cohesion. The authors hypothesized similar findings for adults based on the theoretical rationale that family meals have a positive impact on dietary intake via family cohesion, a reflection of general family functioning that pertains to both adults and adolescents.

METHODS

Participants and Recruitment

Ninety households (n = 152 adults 18 years of age and older, n = 75 adolescents 12-17 years of age) were recruited from the Minneapolis/St. Paul metropolitan area via flyers and brochures posted in community settings, such as schools and libraries, as well as postcards mailed to University of Minnesota employees. Eligible households had at least 1 child ≥12 years of age when only 1 adult was present or at least 1 child ≥5 years of age when more than 1 adult was present to ensure that each household had at least 2 individuals available to participate in intervention activities. Additional eligibility requirements for households included: reside within 20 miles of the University of Minnesota Epidemiology Clinical Research Center; have at least 10 hours of total household television viewing time per week; and no household members with dietary, medical, psychological, or physical limitations that would prevent their participation in intervention activities. Eligibility was assessed during an initial telephone call conducted by trained staff members and confirmed in person during a baseline clinic visit. The University of Minnesota Institutional Review Board approved this study.

Procedures

Data for the present study were collected at baseline, prior to intervention activities, as part of a 12-month community-based household weight gain prevention trial, the Take Action study. All household members attended a baseline clinic visit at the Epidemiology Clinical Research Center, where participants ≥5 years of age were weighed and had their heights measured, and participants ≥12 years of age completed a battery of questionnaires about their dietary and physical activity behaviors. Households were compensated $200 upon completing all baseline data collection activities.

Measures

Demographic information was self-reported by each of the adults and adolescents in the household and included age, sex, and race for all participants; and highest education level attained, employment status, and marital status for adults only. Weight and height of all participants ≥5 years of age was assessed by a trained and certified research staff member. Weight, with participants’ shoes removed, was measured using a calibrated digital scale (PS-6600 ST Portable Scale; Befour, Inc., Saukville, WI, 2003). Height was measured using a stadiometer (Holttain Limited, Cymych, Dyfed, United Kingdom). Body mass index (BMI) was calculated by dividing weight in kg by height in m². For adolescents, BMI was plotted on the Centers for Disease Control and Prevention BMI-for-age growth charts to obtain a percentile ranking. Adolescents with a BMI between the 85th and 95th percentiles were considered overweight, whereas those with a BMI greater than the 95th percentile were considered obese.

Frequency of family meals was reported by adults and adolescents and was assessed with the question, “During the past 7 days, how many times did all or most of your household eat a meal together?” Responses were open ended. Family cohesion was measured as a single construct using the cohesion scale from the Family Adaptability and Cohesion Evaluation Scale-III (FACES-III). The developers of this survey have demonstrated very good evidence of face and content validity as well as good internal (r = 0.77) and test-retest (r = 0.83 after 4-5 weeks) reliability of the cohesion scale. The cohesion scale also demonstrated excellent internal
consistency in the present sample (Cronbach $\alpha = 0.90$). Participants were asked to “describe [their] family/household as it is now by checking the appropriate number (1-5) in the boxes for each item.” Examples of statements that measured family cohesion include “We like to do things with just our immediate family/household,” and “Family/household members feel very close to each other.” Responses ranged from “1-almost never” to “5-almost always.” The cohesion scale of FACES-III was composed of 10 items, and higher summary scores on the scale indicated greater perceived family cohesion (theoretical range: 0-50).

Parent and adolescent food choice was assessed using a self-administered questionnaire adapted from the Diet History Questionnaire (DHQ), a previously validated food frequency questionnaire developed by the National Cancer Institute. The DHQ was modified for this study to measure intake of specific food items; however, the original format for questions and response options were retained. This method is not a comprehensive measure of dietary intake, but instead captures intake of food and beverages within targeted categories that were the focus of intervention messages and activities. Foods and beverages captured by the survey include the following: snacks (3 items: chips, popcorn, and pretzels), sweets (9 items: ice cream, cookies, brownies, cakes, pie, pastries, muffins, chocolate, and candy), fruit (1 item: all types of fruit), vegetables (2 items: all vegetables, lettuce salad), and sugar-sweetened beverages (2 items: regular soda and fruit drinks).

Individuals were asked to report their frequency of consuming various food and beverage items: “Over the past month, how many times did you eat/drink . . . ?”. Response options consisted of 6 ordinal categories: never, 1-3 times last month, 1-2 times per week, 3-4 times per week, 5-6 times per week, and 7 or more times per week. Response options were recoded to reflect an average frequency of consumption per week: 0, 0.5, 1, 1.5, and 2 servings. The average number of servings per week of given items was calculated by multiplying frequency of consumption by average servings.

Data Analysis

All data were analyzed using SAS (version 9.2, SAS Institute, Inc., Cary, NC, 2007). Statistical significance was indicated at the $\alpha < 0.05$ level. Simple ttests and chi-square statistics were used to compare participant demographic characteristics, family cohesion scores, and eating behaviors for adults and adolescents. Pearson correlation coefficients were used to examine cross-sectional associations between participant-reported family cohesion and family meal frequency.

The Baron and Kenny approach to mediation analysis was the primary statistical method used in this study. In mediation analysis, 4 steps are taken to provide evidence for the presence of a mediator. First, it should be demonstrated that the independent variable X is associated with the outcome variable Y. Second, it should be demonstrated that the independent variable X is associated with the mediator variable M. Third, it should be demonstrated that the mediator variable M is associated with the outcome variable Y after controlling for X. Note that X must be controlled when establishing the relationship between the mediator and the outcome to avoid finding a spurious relationship due to confounding of X. Finally, if the effect of X on Y is reduced when M is included in a regression model, there is evidence that the effect of X on Y is partially mediated by M. If the path between X and Y disappears entirely when M is included, complete mediation by M is indicated.

The Figure depicts the various associations that were tested in this study. A series of hierarchical multiple linear regression models were fit whereby each individual’s average weekly servings of a targeted food category (eg, fruit, vegetables, snacks, sweets, sugar-sweetened beverages) were regressed on frequency of family meals, both of which were entered as continuous variables. In addition, each hierarchical linear regression model included a random effect for household to take into account the correlation of responses for members within a household; individual level demographic covariates to improve statistical precision; an individual level indicator variable for respondent type (ie, adult vs adolescent); and the interaction between the respondent type and reported frequency of family meals in order to estimate regression estimates separately for adults and adolescents. Hierarchical linear regression models are appropriate when working with nested data, such as individual-level data nested within households.

Similar regression models were subsequently fit regressing family cohesion scores on frequency of family meals, as well as regressing average weekly servings of a targeted food category on family cohesion scores after controlling for frequency of family meals. Finally, regression models regressing weekly servings of a targeted food category on both family meal frequency and family cohesion score were fit in order to provide evidence for mediation. When mediation was indicated, the percent reduction for the association of family meals and dietary intake as mediated by family cohesion was calculated by subtracting the adjusted regression coefficient for family meal frequency from its unadjusted counterpart, and then dividing by the unadjusted regression coefficient for frequency of family meals. Sobel’s test was used to assess statistical significance of the indirect (mediation) effect. Note that because of the small sample size in the present study, type II error cannot be ruled out when interpreting results.

RESULTS

Participant Characteristics

Roughly 60% of adult participants were female, 80% were white, 58% had a college degree or more education, 86% were currently employed, and 68% were currently married. Approximately 70% of adults and 37% of adolescents were considered
overweight or obese. Participant-reported family cohesion and eating behaviors are shown in Table 1. Adults reported significantly higher scores on the FACES-III cohesion scale, as well as more family meals per week, compared to adolescents. Statistical comparisons of mean servings per week of food items in targeted categories show that adults consumed more vegetables and fewer sugar-sweetened beverages than adolescents.

Relationship Between Family Meal Frequency and Dietary Intake (X → Y)

Regression coefficients (β) for hierarchical linear regression models regressing servings of food items in targeted categories on frequency of family meals are displayed in the first column of Table 2. For adults, significant positive associations were shown for family meal frequency and fruit and vegetable intake. An increase of 1 meal for the number of family meals per week was associated with increases of 0.18 weekly servings of fruit and 0.30 weekly servings of vegetables. For adolescents, significant negative associations were observed for family meal frequency and sweets and sugar-sweetened beverage intake.

Relationship Between Family Cohesion and Family Meal Frequency (X → M)

Pearson correlations demonstrated a significant positive association between participant-reported family meal frequency and family cohesion score (r = 0.41, P < .01). The regression coefficient (β) for hierarchical linear regression models regressing family cohesion score on frequency of family meals was slightly higher for adults (β = .61, standard error [SE] = 0.14) than for adolescents (β = .51, SE = 0.17).

Relationship Between Family Cohesion and Dietary Intake (M → Y)

Regression coefficients (β) for hierarchical linear regression models regressing servings of food items in targeted categories on family cohesion scores are displayed in the second column of Table 2. These estimates are not adjusted for frequency of family meals. For adults, a significant negative association was observed for family cohesion score and sugar-sweetened beverage intake. For adolescents, a significant negative association was observed for family cohesion score and intake of sweets.

Regression coefficients (β) for hierarchical linear regression models regressing servings of food items in targeted categories on family cohesion scores, after controlling for frequency of family meals, are displayed in the third column of Table 2. For adolescents, a significant negative association continued to be observed for family cohesion score and intake of sweets after controlling for frequency of family meals; however, no significant associations were observed for family cohesion and dietary intake for adults after controlling for frequency of family meals.

Mediation Analysis (X → M → Y)

Regression coefficients (β) for hierarchical linear regression models regressing servings of food items in targeted categories on frequency of family meals, after adjusting for family cohesion score, are displayed in the fourth column of Table 2. For adolescents, an increase of 1 for the number of family meals per week was associated with a decrease of 0.30 weekly servings of sweets after controlling for family cohesion. This finding indicates a 21% reduction for the association of family meals and sweets intake as mediated by family cohesion. However, Sobel’s test only suggested a trend toward partial mediation by family cohesion for the relationship between family meal frequency and sweets intake in adolescents (z = 1.72, P = .08).

DISCUSSION

The primary aim of this paper was to examine the relationships between family meal frequency, family cohesion, and average weekly intake of food items in targeted categories. It was hypothesized that family meal frequency would be positively associated with fruit and vegetable intake and negatively associated with snacks,
sweets, and sugar-sweetened beverage intake for both adults and adolescents. Among adults, results suggested that greater family meal frequency was associated with significantly more servings per week of fruits and vegetables, and a trend toward fewer sugar-sweetened beverages. In contrast, Boutelle and colleagues found no significant associations between frequency of family meals and parents’ dietary intake. Such differences may be due to dissimilar research methods, instruments, or sample populations. Boutelle et al used a phone interview to assess usual dietary intake in a sample of women, whereas the current study used an in-person questionnaire to measure dietary intake of a targeted subset of food items in a sample of men and women.

Among adolescents, family meal frequency was associated with significantly fewer weekly servings of sweets and sugar-sweetened beverages, and there was a trend toward greater intake of vegetables. The present findings are somewhat consistent with previous literature, which suggests that among adolescents, greater family meal frequency is positively associated with fruit and vegetable intake and negatively associated with sugar-sweetened beverage intake. The authors did not observe a significant relationship between family meal frequency and fruit intake among adolescents. Differences in results from the present study may stem from the use of a modified food frequency questionnaire that has been validated only for adults, and it may not have been appropriate for use with adolescents. The authors also hypothesized significant associations between family cohesion and dietary intake. Although significant associations were observed between family cohesion and sweets intake among adolescents, there were no statistically significant associations between family cohesion and dietary intake among adults after adjusting for family meal frequency. These findings suggest that family cohesion is unlikely to explain differences in individual dietary intake for either adolescents or adults, which has implications for the hypothesis that family cohesion partially mediates the association between frequency of family meals and dietary intake. Indeed, there was no strong evidence for mediation by family cohesion in any of the models. Mediation analysis could be considered only in instances where both frequency of family meals and family cohesion demonstrated significant associations with dietary intake, which only applied to sweets intake among adolescents. A lack of significant findings overall may be a result of measurement error associated with the assessment tools, or it may simply reflect the fact that family cohesion does not play an important role in explaining the effect of family meals on dietary intake. This latter notion is supported by results from the adjusted models, which indicated that regression estimates for family meal frequency were largely unchanged by the inclusion of the family cohesion covariate.

| Table 2. Regression Coefficients for Food Servings per Week Regressed on Family Meal Frequency and Family Cohesion Among Adults and Adolescents |
|-----------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Dependent variable          | Family Meal Frequency Only | Family Cohesion Score Only | Adjusted for Meal Frequency | Adjusted for Cohesion Score |
| Fruit (intercept)           | 2.08                      | 1.54                      | 2.13                      | 2.13                      |
| Adults, β (SE)              | .18 (0.06)**              | .04 (0.04)                | -.001 (0.04)              | .18 (0.07)**              |
| Adolescents, β (SE)         | -.01 (0.08)               | .01 (0.04)                | -.005 (0.04)              | -.02 (0.08)               |
| Vegetables (intercept)      | 3.52                      | 4.45                      | 5.52                      | 5.52                      |
| Adults, β (SE)              | .30 (0.11)**              | .02 (0.07)                | -.06 (0.07)               | .34 (0.12)*               |
| Adolescents, β (SE)         | .24 (0.13)                | .10 (0.06)                | .07 (0.07)                | .24 (0.13)                |
| Snacks (intercept)          | 5.24                      | 4.99                      | 4.81                      | 4.81                      |
| Adults, β (SE)              | -.04 (0.05)               | .002 (0.02)               | .01 (0.04)                | -.05 (0.06)               |
| Adolescents, β (SE)         | .05 (0.07)                | .04 (0.03)                | .04 (0.03)                | .04 (0.07)                |
| Sweets (intercept)          | 7.23                      | 11.98                     | 11.89                     | 11.89                     |
| Adults, β (SE)              | -.12 (0.13)               | -.14 (0.07)               | -.14 (0.08)               | -.03 (0.14)               |
| Adolescents, β (SE)         | -.38 (0.18)*              | -.17 (0.09)*              | -.15 (0.09)*              | -.30 (0.18)               |
| Sugar-sweetened beverages   |                          |                          |                          |                          |
| Adults, β (SE)              | -.14 (0.07)               | -.10 (0.04)*              | -.07 (0.05)               | -.09 (0.08)               |
| Adolescents, β (SE)         | -.16 (0.10)*              | -.08 (0.05)               | -.06 (0.05)               | -.12 (0.10)               |

*P < .05; **P < .01.
Note: All regression coefficients are adjusted for participant age and sex; regression coefficients for adults are also adjusted for highest education level attained.
Limitations of the present study include a small sample size, which may yield null results due to inadequate power, and the use of cross-sectional data. Because the data are cross-sectional, it is unknown whether family meal frequency determines family cohesion or family cohesion determines frequency of family meals. It is similarly plausible that the 2 variables continuously influence one another. However, previous longitudinal research suggests that frequency of family meals predicts improved family cohesion over time. Thus, the regression models fit family cohesion as the mediator between frequency of family meals and individual food choice. Additionally, the use of Sobel's test to indicate the statistical significance of a mediated effect may not be appropriate for use with hierarchical models. Finally, results presented from this study may not apply to lower-income, minority populations.

This study is unique in that it used a validated questionnaire to measure family cohesion among a sample of adolescents and their parents. Previous researchers have considered the role of family dynamics when examining the influence of family meal frequency on adolescent health outcomes. For example, researchers have adjusted for family connectedness in their analyses in order to describe the association between family meal frequency and outcomes such as disordered eating, substance use, and problem behaviors, above and beyond family connectedness. However, in these studies, family connectedness was not measured with validated instruments, but instead it was characterized by adolescent self-report of their perceived closeness to their mother and/or father using a limited number of questions. In effect, what has been described as family connectedness may not truly reflect perceived family cohesion per se. The measure of family cohesion in the present study, on the other hand, provided a valid assessment of both adult and adolescent perceived family cohesion.

The present study also builds on previous research by examining the associations among family meal frequency, family cohesion, and dietary intake in adults. As previously discussed, the authors observed significant associations between family meal frequency and adult intake of fruits and vegetables. These findings suggest that family meals may have a positive impact on all family members, and not just adolescents. However, evidence for the mediating role of family cohesion for this relationship was lacking.

IMPlications FOR RESEARCH AND PRACTICE

In summary, current theory explaining the relationship between family meal frequency and dietary intake is not well established. This paper attempted to elucidate 1 potential mechanism of this association: family cohesion. It was hypothesized that frequency of family meals was positively associated with perceived family cohesion, which in turn would be related to more healthful dietary intake. Individuals who report greater closeness to their families may be more apt to mirror modeling of healthful diets, be more likely to accept household food rules, or engage in more healthful behaviors in general as a result of improved psychological well-being. Unfortunately, the present findings were unable to establish family cohesion as a consistent mediator of the relationship between family meal frequency and dietary intake in adults or adolescents.

Research in this area would improve from a clearer understanding of why, or perhaps if, family meals are beneficial for dietary intake. Future observational studies should include measures to assess potential mediators in addition to family cohesion, such as role modeling of dietary behavior, household food rules during and outside of mealtimes, and the types and quantities of food offered during meals. Specific factors worth exploring include whether or not parents provide food for their children at meal time that differ from the food they serve themselves; whether or not families eat meals with the television on; whether parents restrict or allow snacking ad libitum outside of meal times; and whether meals consist of prepackaged versus “home-made” food. Finally, longitudinal analyses would shed light on temporal effects related to family meals, potential mediators, and individual dietary intake.

ACKNOWLEDGMENTS

This original manuscript was prepared as part of Ms. Welsh’s doctoral thesis. This study was supported by grants #1U54CA116849 and #R21CA137240 from the National Institutes of Health and the National Cancer Institute.

REFERENCES


