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dinner frequency and dietary  
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and young adults*

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Original Investigation | Nutrition, Obesity, and Exercise

# Exploring the Role of Family Functioning in the Association Between Frequency of Family Dinners and Dietary Intake Among Adolescents and Young Adults

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## Abstract

**IMPORTANCE** Eating meals, particularly dinner, with family members has been associated with improved dietary intake among youths. However, existing studies have not examined how family functioning may moderate or confound this association.

**OBJECTIVE** To examine whether level of family functioning is associated cross-sectionally with frequency of family dinners and dietary intake among a US national sample of adolescents and young adults.

**DESIGN, SETTING, AND PARTICIPANTS** Data from the 2011 questionnaire in the Growing Up Today Study 2 were used for this cross-sectional study. Linear regression models examined the extent to which family dinner frequency was associated with self-reported intake of fruits and vegetables, sugar-sweetened beverages, fast food, and takeout food among 2728 adolescents and young adults (age, 14-24 years). To explore effect modification by family functioning, an interaction term for family functioning and family dinner frequency was included for each dietary outcome. To explore confounding, models adjusted for family functioning were run. All models were stratified by sex and included participant age, educational attainment of mother's spouse or partner, and family structure as covariates. Statistical analysis was conducted between January 1, 2017, and August 31, 2018.

**MAIN OUTCOMES AND MEASURES** Dietary intake measured by consumption of fruits and vegetables, sugar-sweetened beverages, takeout food, and fast food; family dinner frequency per week; and family functioning.

**RESULTS** Among the 2728 participants, there were 1559 female and 1169 male participants who were 14 to 24 years of age (mean [SD] age, 19.4 [1.9] years) and were living with their parents in 2011. Most participants (2453 of 2649 [92.6%]) identified as white. More frequent family dinners were associated with higher-quality dietary intake regardless of level of family functioning; interactions between family functioning and family dinner frequency were not significant. Associations between family meal frequency and dietary intake outcomes did not change substantively when adjusting for family functioning. In adjusted models, more frequent family dinners were associated with higher intakes of fruits (female participants:  $\beta$ , 0.09 servings/d; 95% CI, 0.04-0.15 servings/d; male participants:  $\beta$ , 0.07 servings/d; 95% CI, 0.01-0.12 servings/d) and vegetables (female participants:  $\beta$ , 0.21 servings/d; 95% CI, 0.12-0.30 servings/d; male participants:  $\beta$ , 0.19 servings/d; 95% CI, 0.09-0.30 servings/d), and lower intakes of fast food (female participants:  $\beta$ , -0.04 times/wk; 95% CI, -0.07 to 0.00 times/wk; male participants:  $\beta$ , -0.10 times/wk; 95% CI, -0.15 to -0.04 times/wk) and takeout foods (female participants:  $\beta$ , -0.04 times/wk; 95% CI, -0.07 to -0.01 times/wk; male participants:  $\beta$ , -0.06 times/wk; 95% CI, -0.10 to -0.02 times/wk). More frequent family dinners

*(continued)*

## Key Points

**Question** Does family functioning moderate or confound the association between family dinner frequency and dietary intake among youths?

**Findings** In this cross-sectional study of 2728 US participants 14 to 24 years of age and living with their parents, family functioning did not moderate or confound the association between family dinner frequency and improved dietary intake.

**Meaning** When the goal is to improve dietary intake, family dinners are an appropriate intervention target for all adolescents and young adults regardless of level of family functioning.

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Abstract (continued)

were associated with lower intake of sugar-sweetened beverages for male participants only ( $\beta$ , -0.07 servings/d; 95% CI, -0.13 to -0.02 servings/d).

**CONCLUSIONS AND RELEVANCE** More frequent family dinners are associated with healthful dietary intakes among youths, regardless of level of family functioning. Family dinners may be an appropriate intervention target for improving dietary intake among youths.

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## Introduction

Adolescence and young adulthood are vulnerable life stages for the development of obesity.<sup>1,2</sup> Poor dietary intake has been identified as a key risk factor for excess weight gain among these populations, with diet quality often declining from childhood to adolescence and young adulthood.<sup>2,3</sup> Numerous studies have found that more frequent family meals are associated with improved dietary intake among adolescents and young adults.<sup>4-9</sup> However, to our knowledge, no existing studies have examined how family functioning may influence these associations via effect modification or confounding. Failing to consider family functioning may inappropriately identify family meals as a factor associated with dietary intake when the positive association identified may be true for only some families (ie, those with high family functioning) or may be due to a third variable (ie, the family's level of functioning).<sup>10</sup>

Family functioning is defined by how family members manage daily routines, communicate, and connect emotionally with one another.<sup>11-13</sup> Although, to our knowledge, no studies have examined how family functioning may influence the association between family meals and dietary intake, existing studies have shown that general family functioning is associated with family meal frequency<sup>14</sup> and adolescent dietary intake.<sup>15</sup> Berge and colleagues<sup>14</sup> found that general family functioning was associated with more frequent family meals (girls:  $\beta$  [SE], 0.31 [0.02] meals/wk;  $P < .001$ ; boys:  $\beta$  [SE], 0.25 [0.03] meals/wk;  $P < .001$ ) and improved dietary intake among adolescents, higher fruit and vegetable consumption among female participants ( $\beta$  [SE], 0.06 [0.03] servings/d;  $P = .04$ ), and lower fast food consumption among male participants ( $\beta$  [SE], -0.09 [0.03] times/wk;  $P < .001$ ). Haines and colleagues<sup>15</sup> found that high family functioning was associated with lower odds of eating fast food 1 or more times per week among female adolescents and young adults (adjusted odds ratio, 0.74; 95% CI, 0.61-0.89).<sup>15</sup> Martin-Biggers et al<sup>16</sup> found that high family cohesion (an aspect of family functioning) was associated with modestly higher intakes of fruits and vegetables ( $\beta$  [SE], 0.58 [0.26] servings/wk; 95% CI, 0.06-1.09 servings/wk) among 550 children 2 to 5 years of age. These findings underscore the importance of examining the potential modification or confounding influence that family functioning may have on the association between family meals and dietary intake.

This study aims to examine the cross-sectional association of family dinner frequency with dietary intake among a national sample of US adolescents and young adults, while accounting for family functioning by examining whether it moderates or confounds the association. Results may provide us with a clearer understanding as to the role that family dinners play in improving dietary intake and if this positive association exists for all families regardless of their level of family functioning.<sup>17,18</sup> This understanding may inform the content and appropriate targets for interventions focused on improving the dietary intake of adolescents and young adults.

## Methods

### Study Design and Population

Participants are from the US-based Growing Up Today Study 2 (GUTS2), an ongoing cohort study of offspring of nurses (participants in the Nurses' Health Study II). The GUTS2 cohort was established in 2004; study staff contacted 20700 women in the Nurses' Health Study II who had children 9 to 17 years of age and subsequently mailed questionnaires to 8826 female and 8454 male children whose mothers provided written consent to contact their child. A total of 6002 female and 4918 male participants completed and returned questionnaires, thereby consenting to participate in the GUTS2 cohort. Follow-up questionnaires (online and mailed paper copies) have been sent to participants biannually. This study was approved by the Brigham and Women's Hospital Institutional Review Board and followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for cross-sectional studies.

We restricted analyses to the 2011 questionnaire in which both family dinner frequency and family functioning were assessed ( $n = 6659$ ). Participants with missing data on family dinner, dietary intake, and family functioning were excluded from the analyses ( $n = 1632$ ), resulting in an analytic sample of 5027 (3055 female and 1972 male participants). Because participants may live separately from their parents, we used models examining only participants who reported living with their parents "most of the time" ( $n = 2728$ ; 1559 female and 1169 male participants). Results were similar between children who lived with their parents most of time and those who had moved away.

### Measures

The frequency of family dinners was measured using the question, "How often do you sit down with other members of your family to eat dinner or supper?" Response options were "never/almost never" (coded as 0 times/wk), 1 to 2 times per week (coded as 1.5 times/wk), 3 to 4 times/wk (coded as 3.5 times/wk), or 5 or more times/wk (coded as 5 times/wk).

Dietary intake was examined via the following 4 behaviors: intake of fruit and vegetables, sugar-sweetened beverages (SSBs), fast food, and takeout food. Fruit and vegetable intake was measured using a 27-item food frequency questionnaire assessing intake during the past year using a 10-point ordinal scale ranging from 0 to 6 or more times/d. We analyzed fruit intake and vegetable intake separately and fruit intake was analyzed excluding fruit juice to reflect consumption of whole fruit. Intake of SSBs was measured using 4 questions assessing intake of soda, noncarbonated fruit drinks, sports drinks, and energy drinks during the past year using a 10-point ordinal scale ranging from 0 to 6 or more times/d. Fast food intake was measured using the following question answered on a 5-point ordinal scale ranging from "never" to "once a day or more": "How often did you eat something from a fast food restaurant (eg, McDonalds, KFC, or Wendy's) in the past year?" Consumption of takeout food was measured using the question: "How often did you eat something from a takeout restaurant (Chinese food, pizza, deli, supermarket fully prepared food, Applebee's to go) in the past year?"

Family functioning was assessed using 9 items from the General Family Functioning Scale of the Family Assessment Device.<sup>12</sup> To meet space limitations in the 2011 survey, only 9 items from the original 12-item scale were included; 3 items were worded similarly and were thus excluded (eg, we included "individuals are accepted for who they are" but did not include "we feel accepted for who we are"). The Cronbach  $\alpha$  for the 9 included items is 0.87, indicating strong internal consistency. The scale consists of statements about families; participants indicated the degree to which they agreed with each statement on a 4-point scale (where 1 indicates strongly agree and 4 indicates strongly disagree, with some items reverse coded). The scale also includes items that measure the overall health and pathologic condition of the family relating to the following 6 dimensions of family functioning: problem solving, communication, roles, affective responsiveness, affective involvement, and behavioral control.<sup>12,19</sup> We divided the sum by 9 to give a mean score ranging from 1.0 to 4.0; lower scores indicate better family functioning. Scores were explored as both a continuous

and dichotomous variable; we used the cutpoint of less than 2.17 to indicate high functioning based on previous evidence that this cutpoint effectively discriminates between healthy and unhealthy functioning in families with young children and older adolescents.<sup>13,19,20</sup>

## Covariates

### Age

We calculated participants' age from their birth date and the date the 2011 questionnaire was returned.

### Educational Attainment of Mother's Spouse or Partner

Family meal frequency has been found to be highest among those with higher socioeconomic status.<sup>4</sup> As a measure of socioeconomic status, participants' mothers reported on their spouse or partner's educational attainment in the Nurses' Health Study II in 1999 by indicating the "highest level of education completed by your current spouse or partner." Response options included less than high school, high school graduate, 2-year college, 4-year college, graduate school, or not applicable. Responses were dichotomized to graduated college and not graduated college.

### Family Structure

Family meal frequency has been found to be highest among those from dual-headed households.<sup>21</sup> Family structure was determined based on the most recent report of mothers' living status that was reported in the Nurses' Health Study II in 2005. Response options included the following: mother lives with child and spouse or partner, mother lives with child without partner, and mother does not live with child. Family structure was then dichotomized as "mother lives with child and partner" and "other."

## Statistical Analysis

Although data were collected in 2011, statistical analysis was conducted between January 1, 2017, and August 31, 2018. Analyses were stratified by participants' sex, as family meal frequency and the association of family meals with youth outcomes has been found to differ by sex.<sup>22</sup> We performed analyses separately among participants who indicated that they live with their parents most of the time. Findings are similar to that of the full sample; results are shown only for participants who live at home most of the time. Descriptive and frequency statistics were performed to describe the study sample.

We first examined whether family functioning modified the association between family dinner frequency and dietary intake. We used linear regression models including an interaction variable (family functioning  $\times$  family dinner frequency), with family functioning as both a continuous and dichotomous measure. Results were similar for both continuous and dichotomous models; we present the *P* values for the interaction terms from the continuous model. We also present our results stratified by level of family functioning (high vs low). Second, we examined whether family functioning confounded the association between family dinner frequency and dietary intake using linear regression adjusted for family functioning. Because the distribution of the residuals from the linear regression models were skewed, we replicated the models using a log-transformed form and a dichotomized form of the outcomes. Results were consistent using these transformed outcomes. The untransformed results are reported since they are the most straightforward to interpret. Participants' age, educational attainment of mother's spouse or partner, and family structure were included as covariates in all models. All *P* values were from 2-sided tests and results were deemed statistically significant at *P* < .05.

## Results

### Participant Characteristics

In 2011, the 2728 participants in the study were between the ages of 14 and 24 years (mean [SD] age, 19.4 [1.9] years), 2453 of 2649 participants (92.6%) identified as white, and 2155 of 2685 participants (80.3%) lived in dual-parent homes (**Table 1**). Two-thirds (1770 of 2576 [68.7%]) of the mothers' spouses or partners had graduated college. Most participants (2091 [76.6%]) reported a high level of family functioning, and had a mean (SD) of 3.4 (1.6) family dinners per week.

### Family Dinner Frequency and Adolescent and Young Adult Dietary Intake

#### Female Participants

Our results suggest no significant effect modification by family functioning on the association of family dinner frequency with dietary intake among female participants. Although the effect estimates for some dietary outcomes differed slightly among female participants from high-functioning or low-functioning families, no substantive differences were observed (**Table 2**).

More frequent family dinners were associated with improved dietary intake (model 1; **Table 3**). Among female participants, family dinners were associated with higher intakes of fruits ( $\beta$ , 0.11 servings/d; 95% CI, 0.05-0.16 servings/d) and vegetables ( $\beta$ , 0.25 servings/d; 95% CI, 0.17-0.34 servings/d) and lower consumption of fast food ( $\beta$ , -0.05 times/wk; 95% CI, -0.09 to -0.02 times/wk) and takeout food ( $\beta$ , -0.04 times/wk; 95% CI, -0.08 to -0.01 times/wk) in models adjusted for age, mothers' spouse or partner's educational attainment, and family structure. Frequent family dinners were not significantly associated with SSB consumption for female participants (model 1:  $\beta$ , -0.02 servings/d; 95% CI, -0.04 to 0.01 servings/d). Attenuation of the effect was minimal (<5%) among female participants when family functioning was included in the model (model 2; **Table 3**). In models adjusted for family functioning, among female participants, more frequent family meals were associated with higher intakes of fruits ( $\beta$ , 0.09 servings/d; 95% CI,

Table 1. Participant Characteristics According to Sex and Family Dinner Frequency

| Characteristic  | Total (N = 2728) | Adolescents and Young Adults |                   | Family Dinner, Times/wk |                 |
|---|------------------|------------------------------|-------------------|-------------------------|-----------------|
|   |                  | Male (n = 1169)              | Female (n = 1559) | <5 (n = 1681)           | ≥5 (n = 1047)   |
| Age, mean (SD), y   | 19.4 (1.9)       | 19.4 (1.9)                   | 19.5 (1.9)        | 19.7 (1.9)              | 19.0 (1.8)      |
| Race, No./total No. (%)   |                  |                              |                   |                         |                 |
| White   | 2453/2649 (92.6) | 1050/1145 (91.7)             | 1403/1504 (93.3)  | 1511/1629 (92.8)        | 942/1020 (92.4) |
| Other   | 196/2649 (7.4)   | 95/1145 (8.3)                | 101/1504 (6.7)    | 118/1629 (7.2)          | 78/1020 (7.6)   |
| Family structure, No./total No. (%)                               |                  |                              |                   |                         |                 |
| Dual-parent home  | 2155/2685 (80.3) | 933/1160 (80.4)              | 1222/1525 (80.1)  | 1308/1659 (78.8)        | 847/1026 (82.6) |
| Single-parent home  | 530/2685 (19.7)  | 227/1160 (19.6)              | 303/1525 (19.9)   | 351/1659 (21.2)         | 179/1026 (17.4) |
| Mother's spouse or partner's educational level, No./total No. (%) |                  |                              |                   |                         |                 |
| <College education  | 806/2576 (31.3)  | 343/1105 (31.0)              | 463/1471 (31.5)   | 544/1570 (34.6)         | 262/1006 (26.0) |
| College education   | 1770/2576 (68.7) | 762/1105 (69.0)              | 1008/1471 (68.5)  | 1026/1570 (65.4)        | 744/1006 (74.0) |
| Family functioning, No. (%)                                       |                  |                              |                   |                         |                 |
| High <sup>a</sup>   | 2091 (76.6)      | 889 (76.0)                   | 1202 (77.1)       | 1223 (72.8)             | 868 (82.9)      |
| Low <sup>a</sup>  | 637 (23.4)       | 280 (24.0)                   | 357 (22.9)        | 458 (27.2)              | 179 (17.1)      |
| Family functioning score, mean (SD) <sup>a</sup>                  | 1.9 (0.5)        | 1.9 (0.5)                    | 1.8 (0.5)         | 1.9 (0.5)               | 1.8 (0.5)       |
| Family dinner frequency, mean (SD), dinners/wk                    | 3.4 (1.6)        | 3.4 (1.6)                    | 3.3 (1.7)         | 2.4 (1.3)               | 5.0 (0.0)       |
| Fruit without juice, mean (SD), servings/d                        | 1.5 (1.6)        | 1.3 (1.4)                    | 1.5 (1.8)         | 1.3 (1.5)               | 1.7 (1.8)       |
| Vegetables, mean (SD), servings/d                                 | 2.3 (2.7)        | 2.1 (2.6)                    | 2.4 (2.7)         | 2.1 (2.4)               | 2.7 (3.1)       |
| Sugar-sweetened beverages, mean (SD), servings/d                  | 0.8 (1.2)        | 1.1 (1.5)                    | 0.5 (0.8)         | 0.8 (1.2)               | 0.7 (1.1)       |
| Fast food, mean (SD), times/wk                                    | 1.0 (1.3)        | 1.2 (1.5)                    | 0.8 (1.1)         | 1.1 (1.4)               | 0.8 (1.1)       |
| Takeout food, mean (SD), times/wk                                 | 0.9 (1.1)        | 0.9 (1.1)                    | 0.8 (1.0)         | 0.9 (1.2)               | 0.7 (0.9)       |

<sup>a</sup> Lower family functioning scores indicate better family functioning. A score less than 2.17 indicates high family functioning; 2.17 or higher indicates low family functioning.

0.04-0.15 servings/d) and vegetables ( $\beta$ , 0.21 servings/d; 95% CI, 0.12-0.30 servings/d). More frequent family meals were associated with lower intakes of fast food ( $\beta$ , -0.04 times/wk; 95% CI, -0.07 to 0.00 times/wk) and takeout food ( $\beta$ , -0.04 times/wk, 95% CI, -0.07 to -0.01 times/wk). Frequent family dinners were not significantly associated with reduced SSB intake for female participants in the model adjusted for family functioning (model 2;  $\beta$ , -0.02 servings/d; 95% CI, -0.04 to 0.01 servings/d).

**Male Participants**

Similar to our results among female participants, our results among male participants show no significant effect modification by family functioning on the association of family dinner frequency with dietary intake. The results are similar for male participants in high-functioning and low-functioning families (Table 2).

Among male family members, participation in more frequent family dinners was significantly associated with higher intakes of fruits ( $\beta$ , 0.08 servings/d; 95% CI, 0.02-0.13 servings/d) and vegetables ( $\beta$ , 0.20 servings/d; 95% CI, 0.10-0.30 servings/d) and lower consumption of fast food ( $\beta$ , -0.10 times/wk; 95% CI, -0.16 to -0.04 times/wk), takeout food ( $\beta$ , -0.06 times/wk; 95% CI,

**Table 2. Linear Regression Models Examining Associations of Family Dinner Frequency With Dietary Outcomes, Stratified by Level of Family Functioning**

| Outcome <sup>a</sup>                  | Female Participants                   |                     | Male Participants                     |                     |
|---------------------------------------|---------------------------------------|---------------------|---------------------------------------|---------------------|
|                                       | Effect Estimate (95% CI) <sup>b</sup> | Interaction P Value | Effect Estimate (95% CI) <sup>b</sup> | Interaction P Value |
| Fruit without juice, servings/d       |                                       |                     |                                       |                     |
| High family functioning               | 0.07 (0.01 to 0.14) <sup>c</sup>      | .18                 | 0.08 (0.02 to 0.14) <sup>c</sup>      | .90                 |
| Low family functioning                | 0.14 (0.04 to 0.25) <sup>c</sup>      |                     | 0.05 (-0.04 to 0.14) <sup>c</sup>     |                     |
| Vegetables, servings/d                |                                       |                     |                                       |                     |
| High family functioning               | 0.27 (0.17 to 0.38) <sup>c</sup>      | .17                 | 0.23 (0.11 to 0.35) <sup>c</sup>      | .89                 |
| Low family functioning                | 0.12 (-0.02 to 0.27)                  |                     | 0.11 (-0.07 to 0.30)                  |                     |
| Sugar-sweetened beverages, servings/d |                                       |                     |                                       |                     |
| High family functioning               | -0.04 (-0.07 to -0.01) <sup>c</sup>   | .29                 | -0.05 (-0.11 to 0.01)                 | .66                 |
| Low family functioning                | 0.02 (-0.03 to 0.08)                  |                     | -0.12 (-0.24 to 0.01)                 |                     |
| Fast food, times/wk                   |                                       |                     |                                       |                     |
| High family functioning               | -0.06 (-0.10 to -0.02) <sup>c</sup>   | .71                 | -0.10 (-0.17 to -0.03) <sup>c</sup>   | .94                 |
| Low family functioning                | 0.00 (-0.08 to 0.08)                  |                     | -0.10 (-0.21 to 0.01)                 |                     |
| Takeout food, times/wk                |                                       |                     |                                       |                     |
| High family functioning               | -0.04 (-0.08 to -0.01) <sup>c</sup>   | .59                 | -0.04 (-0.10 to 0.01)                 | .77                 |
| Low family functioning                | -0.04 (-0.11 to 0.03)                 |                     | -0.10 (-0.18 to -0.02) <sup>c</sup>   |                     |

<sup>a</sup> Family functioning scores of 2.17 or higher indicate high functioning, and scores of less than 2.17 indicate low functioning. <sup>c</sup> Significant results at  $P < .05$ .

<sup>b</sup> Adjusted for age, mothers' spouse or partner's educational attainment, and family structure.

**Table 3. Linear Regression Models Examining Associations of Family Dinner Frequency With Dietary Outcomes, Adjusting for Family Functioning**

| Outcome                               | Effect Estimate (95% CI)            |                                     |                                     |                                     |
|---------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
|                                       | Female Participants                 |                                     | Male Participants                   |                                     |
|                                       | Model 1 <sup>a</sup>                | Model 2 <sup>b</sup>                | Model 1 <sup>a</sup>                | Model 2 <sup>b</sup>                |
| Fruit without juice, servings/d       | 0.11 (0.05 to 0.16) <sup>c</sup>    | 0.09 (0.04 to 0.15) <sup>c</sup>    | 0.08 (0.02 to 0.13) <sup>c</sup>    | 0.07 (0.01 to 0.12) <sup>c</sup>    |
| Vegetables, servings/d                | 0.25 (0.17 to 0.34) <sup>c</sup>    | 0.21 (0.12 to 0.30) <sup>c</sup>    | 0.20 (0.10 to 0.30) <sup>c</sup>    | 0.19 (0.09 to 0.30) <sup>c</sup>    |
| Sugar-sweetened beverages, servings/d | -0.02 (-0.04 to 0.01)               | -0.02 (-0.04 to 0.01)               | -0.07 (-0.13 to -0.02) <sup>c</sup> | -0.07 (-0.13 to -0.02) <sup>c</sup> |
| Fast food, times/wk                   | -0.05 (-0.09 to -0.02) <sup>c</sup> | -0.04 (-0.07 to 0.00) <sup>c</sup>  | -0.10 (-0.16 to -0.04) <sup>c</sup> | -0.10 (-0.15 to -0.04) <sup>c</sup> |
| Takeout food, times/wk                | -0.04 (-0.08 to -0.01) <sup>c</sup> | -0.04 (-0.07 to -0.01) <sup>c</sup> | -0.06 (-0.10 to -0.02) <sup>c</sup> | -0.06 (-0.10 to -0.02) <sup>c</sup> |

<sup>a</sup> Model 1: adjusted for age, mothers' spouse or partner's educational attainment, and family structure. <sup>c</sup> Significant results at  $P < .05$ .

<sup>b</sup> Model 2: adjusted for model 1 covariates plus family functioning.

-0.10 to -0.02 times/wk), and SSBs ( $\beta$ , -0.07 servings/d; 95% CI, -0.13 to -0.02 servings/d), when adjusted for age, mothers' spouse or partner's educational attainment, and family structure (model 1; Table 3). Attenuation was minimal (<5%) among male participants for the association between frequent family dinner participation and higher-quality dietary intake after adjusting for family functioning (model 2; Table 3). Specifically, frequent family meals were still associated with higher intakes of fruits ( $\beta$ , 0.07 servings/d; 95% CI, 0.01-0.12 servings/d) and vegetables ( $\beta$ , 0.19 servings/d; 95% CI, 0.09-0.30 servings/d) and lower intakes of fast food ( $\beta$ , -0.10 times/wk; 95% CI, -0.15 to -0.04 times/wk), takeout food ( $\beta$ , -0.06 times/wk; 95% CI, -0.10 to -0.02 times/wk), and SSBs ( $\beta$ , -0.07 servings/d; 95% CI, -0.13 to -0.02 servings/d).

## Discussion

In this US nationwide cohort, we observed that frequent family dinners are significantly associated with improved dietary intakes among youths and that family functioning does not moderate or confound these associations. To our knowledge, this is the first study to explore the role of family functioning in the association between family dinner frequency and improved quality of diet.

It has been argued that family dysfunction may interfere with families' abilities to organize and prepare healthful family meals and diminish the effect or quality of role modeling; families who have regular family meals are also likely to have higher family functioning.<sup>14</sup> However, our findings suggest that not only do families with lower levels of functioning participate in frequent family meals but that family dinners are associated with improved dietary intake, regardless of level of family functioning. Although our results found no evidence of effect modification by level of family functioning, research on the association between family meal frequency and disordered eating suggests that the female participants may be more susceptible to variations in family functioning than the male participants. Loth and colleagues<sup>23</sup> found that the protective nature of frequent family meals against disordered eating behaviors was moderated by level of family functioning among female family members, but not among male family members. Among female members in low-functioning families, frequent family meals were associated with greater odds of engaging in disordered eating behaviors.<sup>23</sup> These results suggest that the association of family meal frequency with the level of family functioning varies depending on the outcome of interest.

Our results are consistent with existing research showing that frequent family meals are associated with improved dietary intake among youths.<sup>4-8,24</sup> Neumark-Sztainer and colleagues<sup>4</sup> found that, after controlling for sociodemographic variables, including mothers' employment status and socioeconomic status (the primary marker was parental educational level), frequent family meals were positively associated with intake of fruits and vegetables and negatively associated with soft drink consumption. Our results extend this past research by examining whether frequent family dinners are associated with improved dietary intakes over and above the influence of family functioning.<sup>14,15</sup>

Our results suggest that family dinners are an appropriate target for improving youths' dietary intake. Although for some families, family-based therapy to improve family functioning may be important for other aspects of adolescent health or to reduce engagement in risky behaviors, such as drug use,<sup>17</sup> when the goal is to improve dietary intake, participation in frequent family meals is an appropriate intervention method, even for families with lower levels of functioning. Previous research from the GUTS cohorts indicates that youth participation in family dinners has been on the decline since the cohort was established in 1996.<sup>25</sup> Future studies need to explore methods to support families in eating together, especially during this life stage when individuals are at increased risk of poor dietary intake<sup>3</sup> and excess weight gain,<sup>26</sup> in comparison with other life stages.<sup>27</sup>

Participating in frequent family meals reduces opportunities to eat outside of the home; food eaten at home is often healthier than food eaten outside of the home.<sup>4,28</sup> Although we did not examine the types of foods eaten during the shared family dinners in this study, our result showing

that frequent family meals were associated with lower levels of takeout food consumption suggests that dinners are likely to have been prepared in the home.

More important, although our study adds to a large body of literature highlighting the many benefits of frequent family meals, to our knowledge, few interventions focused on the importance of family meals exist<sup>29-35</sup> and only 1 has focused on adolescents.<sup>36</sup> DeBar and colleagues<sup>36</sup> developed a 5-month program for overweight adolescent girls (mean [SD] age, 14.1 [1.4] years) in a primary care setting focused on family meals, healthy eating, and other markers of well-being including physical activity and mental health. At the 12-month follow-up, intervention participants reported a smaller decrease in the number of family meals (from 3.85 to 3.51 meals/wk vs from 4.34 to 3.29 meals/wk;  $P = .03$ ) and less fast food consumption (from 1.17 to 1.00 times/wk vs from 1.27 to 1.55 times/wk;  $P = .02$ ) in comparison with control participants.<sup>36</sup> Although this research highlights the success that family meal interventions can have, it targeted only overweight girls. Future research should explore interventions aimed at increasing the frequency of family meals within a broader population of youths.

Exploring differences between high-functioning and low-functioning families who participate in frequent family meals and those who do not participate in frequent family meals may also point to important areas of intervention. Given the associations between high family functioning and family dinner participation,<sup>14,15</sup> it may be especially important to test strategies to support lower-functioning families in times of transition and stress or when life necessitates that they spend meal times at work or providing care for others, to ensure that they continue eating together. In their research exploring the differences between single-headed families and dual-headed families in barriers to family meals, Berge et al<sup>37</sup> highlight this idea of tailoring intervention strategies based on sociodemographic characteristics. Given our finding that there are both high-functioning and dual-headed families who do not participate in frequent family dinners, more general strategies to support family dinners will also be beneficial to many families. Work schedules, activities after school, and a lack of meal planning are commonly cited barriers to family dinner participation.<sup>29</sup> Interventions that promote youth involvement in meal preparation may be particularly promising to not only lessen the burden of time, but to also strengthen the benefits that shared meals have on their dietary intake.<sup>38</sup>

## Limitations

This study has a number of limitations that should be considered when interpreting our results. All data are based on self-report; thus, there is the potential for bias and misinterpretation. Owing to availability of data, the analyses of this study were restricted to the 2011 GUTS2 questionnaire and were thus cross-sectional. Future studies should use longitudinal designs, which will also help researchers to understand how the association between family dinner frequency, dietary intake, and family functioning changes and evolves within families over time. This study measured only family dinners, as opposed to family meals in general, which may underrepresent the frequency with which participants eat with other family members. However, previous research has suggested that there is no difference in reporting a protective association between studies that consider family meals in general vs dinner specifically.<sup>17</sup> Although we have a large study population of participants who reside throughout the United States, our cohort is not a representative sample of US adolescents and young adults. Participants are children of registered nurses and the cohort is more than 90% white, which may reduce the generalizability of our findings. We calculated 40 tests (Table 2 and Table 3) and did not adjust for multiple comparisons. However, of these tests, 29 were statistically significant at the  $P < .05$  level, much larger than the 2 tests we would expect to be statistically significant by chance. Also, the small effect sizes for some of our outcomes suggest that, while a linear association exists between family meal frequency and improved dietary intake over and above family functioning, a threshold effect is possible given the relatively low levels of fast food, takeout food, and SSB consumption among this population. Future research should examine these associations among populations where consumption of such foods is higher.

## Conclusions

Although research has indicated that family dinners may be associated with improved dietary intake among youths, to our knowledge, no studies have explored how the level of family functioning may moderate or confound the association. Our results suggest that frequent family meals are associated with higher intakes of fruits and vegetables and lower intakes of fast food and takeout food for both female and male youths in both high-functioning and low-functioning families. Family meals are an appropriate intervention target to help improve youths' dietary intake. Future studies should examine ways to support families in eating together frequently as well as methods of keeping children engaged in family meals as they transition into adolescence and young adulthood.

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### ARTICLE INFORMATION

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**Correction:** This article was corrected on March 1, 2019, to reflect that this article is published under the CC-BY License.

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