

No Time for Family Meals? Parenting Practices Associated with Adolescent Fruit and Vegetable Intake When Family Meals Are Not an Option



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ABSTRACT

Background Despite research linking family meals to healthier diets, some families are unable to have regular meals together. These families need guidance about other ways to promote healthy eating among adolescents.

Objective Our aim was to examine the association between various parenting practices and adolescent fruit and vegetable (F/V) intake at different levels of family meal frequency.

Design We conducted a cross-sectional, population-based survey of influences on adolescent weight-related behaviors using Project EAT (Eating and Activity in Teens) 2010.

Participants/setting Participants were 2,491 adolescents recruited from middle/high schools in Minneapolis/St Paul, MN.

Measures Adolescent F/V intake was ascertained with a food frequency questionnaire. Survey items assessed frequency of family meals and F/V parenting practices (availability, accessibility, parent modeling, parent encouragement, and family communication).

Statistical analyses Linear regression models were used to examine associations with and interactions among family meals and parenting practices. Models were adjusted for age, sex, socioeconomic status, race/ethnicity, and energy intake (kilocalories per day).

Results Family meals, F/V availability, F/V accessibility, F/V modeling, and encouragement to eat healthy foods were independently associated with higher F/V intake. Of the 949 (34%) adolescents who reported infrequent family meals (≤ 2 days/wk), mean F/V intake was 3.6 servings/day for those with high home F/V availability vs 3.0 servings/day for those with low home F/V availability. Similar differences in mean F/V intake (0.3 to 0.6 servings/day) were found for high vs low F/V accessibility, parental modeling, and parent encouragement for healthy eating. Frequent family meals in addition to more favorable parenting practices were associated with the highest F/V intakes.

Conclusions Food parenting practices and family meals are associated with greater adolescent F/V intake. Longitudinal and intervention studies are needed to determine which combination of parenting practices will lead to improvements in adolescent diets.

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FAMILIES HAVE AN IMPORTANT INFLUENCE ON adolescent health behaviors, including fruit and vegetable (F/V) intake. Parents shape the home environment in which many food choices are made and employ a variety of intentional or unintentional practices that can contribute to their child's intake, such as modeling, setting routines, and establishing rules.^{1,2} There is currently a need to identify what parents can do to promote F/V intake among adolescents because adolescent obesity has risen dramatically in the last several decades, F/V are critical for adequate nutrition, and many adolescents do not meet F/V guidelines.³⁻⁵ A key factor that has been identified and recommended as a high priority for parents is to have regular

family meals. This recommendation is based on cross-sectional and longitudinal research that links frequent family meals with improved dietary practices, particularly F/V intake.⁶

Positive associations between frequent family meals and adolescent F/V intake have been consistently identified across studies with diverse samples.⁷⁻¹¹ In addition, more frequent family meals in adolescence predicts greater F/V intake into young adulthood.¹² Although the nutritional benefits of family meals are well documented,^{9,13} many families do not sit down for regular family meals for a variety of reasons. Barriers to regular family meals include conflicting work schedules, before- and after-school activities, stress, financial

resources, and a lack of suitable space to sit and eat together,^{14,15} many of which are difficult to overcome. This mismatch between recommendations and the reality experienced by many families may lead parents to feel helpless, frustrated, or guilty. Sociologists and the popular media have also pointed out that this message may lead to unwarranted stress and extreme expectations for caregivers working outside the home.^{16,17} The present study was designed to address some of these concerns. Parents who are unable to provide regular family meals need alternative strategies they can use to promote healthier diets among adolescents.

In addition to regular family meals, a variety of other parenting practices have been identified in the literature to promote healthy diets and may act as alternative strategies for parents to employ when they are unable to have regular family meals.^{1,2} These practices include home F/V availability and accessibility (ie, in plain view, ready to eat), and parental encouragement and modeling of healthy eating.^{1,2} Adolescent participants in Project EAT (Eating and Activity in Teens) 2010 were previously found to eat more F/V when these foods were present in the home, easily accessible, and when parents modeled or encouraged healthy eating.^{11,18} Broader practices related to the family climate were also associated with higher adolescent F/V consumption.¹¹ For example, strong parent–adolescent communication may contribute to an adolescent's willingness to undertake health-promoting behaviors like eating nutrient-dense foods.¹⁹ However, it remains unclear to what extent these parenting practices are important for promoting F/V intake in the absence of regular family meals.

This study extends previous research on family meals by identifying parenting practices that are associated with adolescent F/V intake independently of family meals and at different levels of family meal participation (infrequent vs frequent family meals). In particular, this study sought to identify parenting practices associated with increased F/V intake among adolescents who have infrequent family meals. It was hypothesized that for adolescents who have infrequent family meals, exposure to other favorable parenting practices—such as strong parent–child communication, F/V that are readily available and accessible at home, and parents who model and encourage healthy eating—would be positively associated with F/V intake.

METHODS

Participants and Procedures

Data were drawn from Project EAT 2010, a diverse population-based cross-sectional study of 2,793 adolescents attending 20 public middle schools and high schools in the metropolitan area of Minneapolis/St Paul, MN, during 2009–2010. Adolescents completed an in-class survey that included questions about their family/home environment, and a food frequency questionnaire (FFQ) to assess dietary intake. Procedures have been described in detail elsewhere.¹¹ Adolescents had the opportunity to provide written assent only if their parent/guardian did not return a signed form indicating their refusal to have their child participate. Among adolescents who were at school on the days of survey administration, 96.3% had parental consent and chose to participate. Procedures were approved by the University of Minnesota's Institutional Review Board.

Youth and Adolescent FFQ

The 149-item Youth and Adolescent FFQ was used to estimate adolescent F/V and energy intake (kilocalories per day). The tool's validity and reliability were previously examined for the estimation of mean nutrient intakes in a sample of youth aged 9 to 18 years and found to be within acceptable ranges for dietary assessment.^{20,21} Previous research with the FFQ has found conceptually relevant variables to predict mean F/V intake, and has used mean F/V intake to predict health-related outcomes.^{22,23} Responses to the FFQ were excluded for 123 participants that reported a biologically implausible level of total energy intake (<400 kcal/day or >7,000 kcal/day).

F/V intake was the outcome of interest and was assessed in reference to the past year. Usual intake was estimated based on reported intake of 30 items: raisins, grapes, bananas, cantaloupe/melons, apples/sauce, pears, oranges/grapefruit, strawberries, peaches/plums/apricots, orange juice, apple/other juice, mashed potatoes, tomatoes, tomato/spaghetti sauce, string beans, broccoli, beets, corn, peas/lima beans, mixed vegetables, spinach, greens/kale, green/red peppers, yam/sweet potatoes, zucchini/squash/eggplant, cooked carrots, celery, lettuce/salad, coleslaw, and potato salad. A daily serving was defined as the equivalent of $\frac{1}{2}$ cup of fruits or vegetables or 1 glass of juice (size of glass interpreted by the participant). Mean intakes across the different items ranged from a low of 0.1 servings/day of beets to a high of 0.5 servings/day of apple juice.

Adolescent Survey

The EAT survey is a 235-item, self-report questionnaire assessing factors of relevance to nutrition and weight-related health.²⁴ Estimates of test–retest reliability were determined during a 1-week period in a diverse sample of 129 middle and high school students. For categorical and dichotomous variables, the Spearman correlation (ρ) and percent agreement between the two time points were calculated, respectively, and are presented. A value ≥ 0.6 is considered acceptable reliability.²⁵

Family meals were assessed by asking adolescents: “During the past seven days, how many times did all, or most, of your family living in your house eat a meal together?” Response options included: never, one to two times, three to four times, five to six times, seven times, and more than seven times. Three categories were created to reflect infrequent family meals (≤ 2 meals/wk), occasional (3 to 4 meals/wk), and frequent family meals (≥ 5 meals/wk) ($\rho=0.71$). These cut points have been previously shown to predict adolescent diet, weight, and health outcomes.¹³

Parent communication was assessed with the following items, asked separately for mothers and fathers:²⁶ 1) “How much do you feel your mother/father cares about you?” and 2) “How much do you feel you can talk to your mother/father about your problems?” Response options were: not at all, a little, somewhat, quite a bit, and very much. Responses were averaged across items (range=1 to 5). The internal consistency of the scale (ie, how well the items that make up the scale are correlated to one another and the total scale score) was assessed with Cronbach's α and found to have an acceptable value of .81. For the analysis described here, a single dichotomous variable was created to allow for comparison between high and low parent communication

(1=a score of 4 or 5, and 0=all other responses) (agreement=82.4%).

Home availability of F/V was assessed by asking adolescents how frequently F/V were available at home, with the following four response options: never, sometimes, usually, and always. Responses were dichotomized, where 1=usually or always having F/V at home and 0=all other responses (agreement=90.1%).

Home accessibility of F/V was assessed by asking adolescents how often fruit was on the counter, table, or somewhere they could easily get it; and how often there were cut-up vegetables in the fridge. Response options were: never, sometimes, usually, and always. A single dichotomous item was computed, where 1=usually or always having either fruits or vegetables accessible and 0=all other responses (agreement=100%).

Parent modeling of F/V intake was assessed by asking adolescents to report whether their mother/father 1) eats a lot of fruit and 2) eats vegetables with dinner. Response options were: never, rarely, sometimes, and on a regular basis. A single dichotomous variable was computed, where 1=any parent models fruit or vegetable consumption on a regular basis and 0=all other responses (agreement=77.9%).

Parent encouragement for healthy eating was assessed by asking adolescents' whether their mother/father encourages them to eat healthy foods. Four response options were: not at all, a little bit, somewhat, and very much. No definitions or explanation were provided for the term *healthy foods* or the response options. A single dichotomous variable was computed, where 1=any parent encourages healthy eating very much and 0=all other responses (percent agreement=76.6%).

Sociodemographic characteristics, including race/ethnicity, socioeconomic status (SES), sex, and school type (middle vs high school), were assessed by adolescent self-report. Race/ethnicity was categorized as 1) white, 2) black, 3) Hispanic, 4) Asian, or 5) mixed/other. The SES variable was derived primarily from the higher education level of either parent.²⁷ An algorithm using classification and regression trees was developed, whereby a missing variable was replaced by a correlated surrogate variable. Algorithmic classification scores were reduced by two levels if the family received public assistance and by two if the child was eligible for free or reduced-cost school meals or had two unemployed parents. In 4% of adolescents, no data were available on which to assign SES. The five-level variable was collapsed into three categories: low, middle, and high SES.

Analysis

The analysis was restricted to 2,491 adolescents with complete data on dietary intake and family meal frequency. Those with missing data ($n=302$) were not socioeconomically different ($P=0.2$), but were more likely to be male, younger age, and black ($P<0.05$) than those retained in the analysis. Adolescent sociodemographic and parenting practices were examined by family meal frequency, and group differences examined with Pearson χ^2 tests. Linear regression models were used to examine the following: 1) models assessing F/V intake and each parenting practice alone and then a model that included all parenting practices included as one block; and 2) interactions between family meal frequency and exposure to other parenting practices on F/V intake. Multiplicative and

additive interactions were tested and consistent patterns of interactions with $P<0.10$ across the parenting practices were found. Therefore, to simplify the interpretation of interactions, results are presented stratified by family meal frequency. All models were adjusted for adolescent age, sex, SES, race/ethnicity, and energy intake (kilocalories per day). F/V intake was positively skewed; however, square root transformation to approximate normality did not change the results meaningfully, and model residual values were approximately normally distributed. Variation inflation factors were examined and there was no indication of collinearity between any of the model variables. Results of models assessing each parenting practice alone and then assessing a model, including all parenting practices are presented as unstandardized regression coefficients and standard errors, and adjusted mean F/V intake and standard errors for each level of the independent variable. Unstandardized coefficients represent the change in daily mean servings of F/V as a function of the independent variable. Stratified results are presented as mean servings of F/V and standard errors for those who report frequent, occasional, and infrequent family meals. Other variables had $<3\%$ missing data; therefore, complete cases were used for each particular model. A P value <0.05 was considered statistically significant and all analyses were conducted using STATA 13 statistical software.²⁸

RESULTS

The mean age and standard deviation (SD) of the analytic sample was 14.5 (2.0) years; 44.6% were in middle school (6th to 8th grades); and 55.4% were in high school (9th to 12th grades). Just over half of participants were female (53.9%) and approximately 60% of participants qualified for free or reduced-price school meals. The racial/ethnic backgrounds of the participants were as follows: 27.8% African American or black, 19.5% white, 20.8% Asian American, 17.2% Hispanic, 3.6% Native American, and 11.1% mixed or other.

Adolescents consumed a mean (SD) of 3.7 (2.9) servings of F/V per day. Across family meal frequency, F/V intake was lowest for those who had infrequent family meals (mean [SD] servings=3.3 [2.6]) and highest for those who had frequent family meals (mean [SD] servings=4.2 [3.1]). The proportion of adolescents who consumed five or more servings of F/V per day increased as frequency of family meals increased, 19% (infrequent meals), 25% (occasional meals), and 32% (frequent meals) (data not shown in Tables).

Thirty-five percent of adolescents ($n=864$) reported infrequent family meals (Table 1). Adolescents who reported infrequent family meals were more likely to be female, be in high school, identify themselves as black, and be from low-SES households compared to adolescents who reported more frequent family meals ($P<0.01$). Adolescents who reported infrequent family meals also had less favorable parenting practice profiles (eg, lower F/V availability and accessibility) as compared with adolescents who reported frequent family meals ($P<0.001$).

Associations between Family Meals, Parenting Practices, and F/V Intake

In individual and mutually adjusted models controlling for covariates, family meals, F/V availability, F/V accessibility, parent F/V modeling, and parent encouragement for healthy

Table 1. Proportion of adolescents in Project Eating and Activity in Teens 2010^a having infrequent, occasional, and frequent family meals by sociodemographic characteristics and parenting practices (n=2,491)

Variable	Family Meal Frequency (Past Week) ^b			P value
	Infrequent (≤2 times) (n=864)	Occasional (3 to 4 times) (n=534)	Frequent (≥5 times) (n=1,093)	
	←-----%-----→			
Adolescent characteristics				
Sex, female (n=2,491)	37.3	20.8	41.9	0.01
School level (n=2,491)				
High school	37.9	23.0	39.1	<0.001
Middle school	30.6	19.5	49.9	
Race/ethnicity (n=2,484)				
White	27.2	20.8	52.0	<0.001
Black	39.9	20.9	39.3	
Hispanic	33.9	20.3	45.8	
Asian	32.1	25.3	42.6	
Mixed/other	39.6	19.5	40.9	
Socioeconomic status (n=2,427)				
Low	39.3	21.7	39.0	<0.001
Middle	33.5	20.8	45.7	
High	22.1	20.2	57.7	
Parenting practices ^c				
Parent communication, high (n=2,479)	24.1	20.3	55.7	<0.001
Home availability of fruits and vegetables, usually/always (n=2,486)	32.0	20.8	47.3	<0.001
Home accessibility of fruits and vegetables, usually/always (n=2,485)	31.1	21.0	48.0	<0.001
Parents model fruit and vegetable intake, on a regular basis (n=2,456)	30.2	21.0	48.8	<0.001
Parent encouragement for healthy eating, very much (n=2,456)	27.4	21.1	51.5	<0.001

^aProject EAT (Eating and Activity in Teens) participants were adolescents recruited from Minneapolis/St Paul, MN, middle and high schools during 2009-2010.

^bCell sizes vary due to a small amount of missing data for individual items; columns may not add to 100 due to rounding. Family meals based on one item assessing past week frequency of eating meals together with all or most of your family living in your house (never, 1 to 2, 3 to 4, 5 to 6, 7, or 7+ days/week).

^cParenting practice variables are dichotomous. Parent communication scale (score range=1 to 5) of two items assessing mother/father caring and comfort talking to parents about problems (1=not a lot, 2=a little, 3=somewhat, 4=quite a bit, 5=very much; high=a score of 4 or 5; low is a score of 1 to 3); home availability based on one item assessing how frequently fruits and vegetables were available at home (1=never, 2=sometimes, 3=usually, 4=always); home accessibility based on two items assessing how frequently fruit was on counter, table, or somewhere they could easily get it, and how often there were cut-up vegetables in the fridge (1=never, 2=sometimes, 3=usually, 4=always); parent modeling based on four items assessing whether mother/father eats a lot of fruit and eats vegetables with dinner (1=never, 2=rarely, 3=sometimes, 4=on a regular basis), and scores were based on having at least one parent model fruit or vegetable intake on a regular basis; parent encouragement based on two items assessing whether mother/father encourages them to eat healthy foods (1=not at all, 2=a little, 3=somewhat, 4=very much), and scores were based on having at least one parent very much encouraging healthy eating.

eating were independently associated with higher F/V intake (Table 2). For example, independent of family meals and the other parenting practices examined, adolescents consumed an additional half serving of F/V per day when F/V were frequently accessible to them (on the counter/cut up in the refrigerator) as compared with less frequently accessible. In contrast, parent communication was no longer significantly associated with F/V intake after controlling for family meals and the other parenting practices.

Stratified Results by Family Meal Frequency

Most parenting practices were associated with higher F/V intake in the absence of family meals. Among adolescents

who reported infrequent family meals, adolescents who had high home F/V availability, F/V accessibility, parent F/V modeling, or parent encouragement consumed 0.3 to 0.6 more servings of F/V per day compared to adolescents with low exposure to these same parenting practices. In contrast, adolescents who reported infrequent family meals consumed fewer servings of F/V when parent communication was high compared to low (Table 3).

Stratified results allowed for the comparison of adolescents exposed to healthful parenting practices in the absence of regular family meals (parenting practices alone) to those not exposed to healthful parenting practices but reported frequent family meals (family meals alone). Most parenting

Table 2. Individual and relative associations between parenting practices and adolescent fruit and vegetable intake among adolescent participants of Project Eating and Activity in Teens 2010^a

Parenting practices ^e	Fruit and Vegetable Intake ^b					
	Individual Models ^c			Mutually Adjusted Model ^d		
	Unstandardized regression coefficient (SE) ^f	P value	Adjusted mean (SE)	Unstandardized regression coefficient (SE)	P value	Adjusted mean (SE)
Family meals						
Infrequently (<3 times/wk)	Ref ^g		3.5 (0.1)	Ref		3.6 (0.1)
Occasional (3 to 4 times/wk)	0.18 (0.12)	0.13	3.6 (0.1)	0.12 (0.12)	0.30	3.7 (0.1)
Frequent (≥5 times/wk)	0.56 (0.10)	<0.001	4.0 (0.1)	0.36 (0.10)	0.001	3.9 (0.1)
Parent communication						
Low	Ref		3.6 (0.1)	Ref		3.7 (0.1)
High	0.28 (0.09)	0.002	3.9 (0.1)	−0.01 (0.09)	0.95	3.7 (0.1)
Home availability of fruits and vegetables						
Never/rarely	Ref		3.0 (0.1)	Ref		3.5 (0.1)
Usually/always	0.82 (0.12)	<0.001	3.9 (0.1)	0.29 (0.14)	0.04	3.8 (0.1)
Home accessibility of fruits and vegetables						
Never/rarely	Ref		3.1 (0.1)	Ref		3.4 (0.1)
Usually/always	0.79 (0.11)	<0.001	3.9 (0.1)	0.47 (0.12)	<0.001	3.8 (0.1)
Parents model fruit and vegetable intake						
Never/sometimes	Ref		3.3 (0.1)	Ref		3.5 (0.1)
On a regular basis	0.76 (0.09)	<0.001	4.0 (0.1)	0.45 (0.10)	<0.001	3.9 (0.1)
Parent encouragement for healthy eating						
Never/somewhat	Ref		3.3 (0.1)	Ref		3.5 (0.1)
Very much	0.75 (0.09)	<0.001	4.1 (0.1)	0.46 (0.10)	<0.001	4.0 (0.1)

^aProject EAT (Eating and Activity in Teens) participants were adolescents recruited from Minneapolis/St Paul, MN, middle and high schools during 2009–2010.^bCoefficient represents the change in daily servings of fruits and vegetables with a 1-unit change in the independent variable adjusted for covariates (eg, adolescents who have high parent communication consume 0.27 more servings of fruits and vegetables than adolescents who have low parent communication controlling for covariates).^cIndividual models control for age, sex, socioeconomic status, race/ethnicity, and energy intake.^dMutually adjusted model additionally controls for each independent variable.^eFamily meals based on one item assessing past week frequency of eating meals together with all or most of your family living in your house (never, 1 to 2, 3 to 4, 5 to 6, 7, or 7+ days/wk); parent communication scale (score range=1 to 5) of two items assessing mother/father caring and comfort talking to parents about problems (1=not a lot, 2=a little, 3=somewhat, 4=quite a bit, 5=very much; high= a score of 4 or 5; low is a score of 1 to 3); home availability based on one item assessing how frequently fruits and vegetables were available at home (1=never, 2=sometimes, 3=usually, 4=always); home accessibility based on two items assessing how frequently fruit was on counter, table, or somewhere they could easily get it, and how often there were cut-up vegetables in the fridge (1=never, 2=sometimes, 3=usually, 4=always); parent modeling based on four items assessing whether mother/father eats a lot of fruit and eats vegetables with dinner (1=never, 2=rarely, 3=sometimes, 4=on a regular basis), and scores were based on having a least one parent model fruit or vegetable intake on a regular basis; parent encouragement based on two items assessing whether mother/father encourages them to eat health foods (1=not at all, 2=a little, 3=somewhat, 4=very much), and scores were based on having at least one parent very much encouraging healthy eating.^fSE=standard error.^gRef=reference group.

practices alone were associated with higher F/V intake compared to frequent family meals alone. This pattern was found for F/V availability, accessibility, and parent encouragement. For example, adolescents who had high availability of F/V but infrequent family meals consumed 3.6 mean servings of F/V per day (95% CI 3.4 to 3.7) compared to 3.0 mean servings of F/V per day (95% CI 2.5 to 3.4) consumed by adolescents with frequent family meals but low availability of F/V.

The combination of frequent family meals and other healthful parenting practices were most strongly associated

with F/V intake. For example, when parents regularly modeled or encouraged F/V intake/healthy eating, adolescents consumed more F/V as the frequency of family meals increased. Differences ranged from 0.5 to 0.9 mean servings/day for frequent as compared to infrequent family meals. In contrast, when parenting practices were unfavorable, mean servings of F/V did not significantly differ across family meal frequency. For example, adolescents who had low F/V availability at home consumed about three mean servings of F/V per day regardless of family meal frequency.

Table 3. Adjusted mean fruit and vegetable intake (95% CI) by parenting practices and family meal frequency among adolescent participants of Project Eating and Activity in Teens 2010^a

Parenting practices ^c	Family Meal Frequency (Past Week) ^b		
	Infrequent (≤2 times)	Occasional (3 to 4 times)	Frequent (≥5 times)
Parent communication	←—————adjusted mean (95% CI)————→		
Low	3.5 (3.3-3.7) ^{wx}	3.6 (3.3-3.8) ^{wx}	3.7 (3.5-4.0) ^x
High	3.3 (3.1-3.6) ^w	3.7 (3.4-4.0) ^x	4.2 (4.0-4.3) ^y
Home availability of fruits and vegetables			
Never/rarely	3.0 (2.7-3.3) ^w	3.2 (2.7-3.6) ^{wx}	3.0 (2.5-3.4) ^w
Usually/always	3.6 (3.4-3.7) ^{xy}	3.7 (3.5-3.9) ^y	4.1 (4.0-4.3) ^z
Home accessibility of fruits and vegetables			
Never/rarely	3.0 (2.7-3.3) ^w	3.3 (2.9-3.7) ^{wx}	3.2 (2.8-3.5) ^w
Usually/always	3.6 (3.5-3.8) ^{xy}	3.8 (3.5-4.0) ^y	4.2 (4.0-4.3) ^z
Parents model fruit and vegetable intake			
Never/sometimes	3.2 (2.9-3.4) ^w	3.3 (3.0-3.6) ^w	3.3 (3.0-3.6) ^w
On a regular basis	3.6 (3.4-3.8) ^x	3.9 (3.6-4.1) ^x	4.3 (4.2-4.5) ^y
Parent encouragement for healthy eating			
Never/somewhat	3.3 (3.1-3.5) ^w	3.3 (3.0-3.5) ^w	3.5 (3.3-3.7) ^{wx}
Very much	3.6 (3.4-3.9) ^x	4.0 (3.8-4.3) ^y	4.4 (4.2-4.6) ^z

^aProject EAT (Eating and Activity in Teens) participants were adolescents recruited from Minneapolis/St Paul, MN, middle and high schools during 2009-2010.

^bMean values are based on five individual linear regression models adjusted for age, sex, socioeconomic status, ethnicity, and energy intake run separately for each of the five parenting practices listed in column one; family meals based on one item assessing past week frequency of eating meals together with all or most of your family living in your house (never, 1 to 2, 3 to 4, 5 to 6, 7, or 7+ days/wk).

^cParenting practice variables are dichotomous. Parent communication scale (score range=1 to 5) based on two items assessing mother/father caring and comfort talking to parents about problems (1=not a lot, 2=a little, 3=somewhat, 4=quite a bit, 5=very much; high=a score of 4 or 5; low is a score of 1 to 3); home availability based on one item assessing how frequently fruits and vegetables were available at home (1=never, 2=sometimes, 3=usually, 4=always); home accessibility based on two items assessing how frequently fruit was on counter, table, or somewhere they could easily get it, and how often there were cut-up vegetables in the fridge (1=never, 2=sometimes, 3=usually, 4=always); parent modeling based on four items assessing whether mother/father eats a lot of fruit and eats vegetables with dinner (1=never, 2=rarely, 3=sometimes, 4=on a regular basis), and scores were based on having at least one parent model fruit or vegetable intake on a regular basis; parent encouragement based on two items assessing whether mother/father encourages them to eat healthy foods (1=not at all, 2=a little, 3=somewhat, 4=very much), and scores were based on having at least one parent very much encouraging healthy eating.

^{wxyz}Mean values with different superscript letters within each parenting practice/family meal frequency combination (comparing six values; across rows and columns) represent a statistically significant difference at $P < 0.05$ (eg, mean fruit and vegetable intake is significantly different when comparing infrequent, occasional, and frequent family meals when parent communication is high; when comparing low and high parent communication when family meals are frequent; and when comparing the combination of frequent family meals and high parent communication with any of the other combinations).

DISCUSSION

This study aimed to identify ways in which parents could promote F/V intake among adolescents in the absence of frequent family meals. This was accomplished by exploring associations between family meals and adolescent F/V intake in combination with other parenting practices. Almost a quarter of adolescents who reported infrequent family meals consumed at least a mean of 5 servings of F/V daily and may be explained by other familial factors. Indeed, healthful parenting practices, such as home F/V availability and accessibility, and parents who model F/V consumption and encourage healthy food choices, were associated with greater F/V intake among adolescents who reported infrequent family meals. To improve adolescent F/V intake, registered dietitian nutritionists and health practitioners should support and counsel parents to employ a range of healthful parenting practices.

This study was designed to build on previous research linking family meals to healthier eating and address concerns

that many families find it difficult to implement family meals on a regular basis.^{6,16} As also documented in previous studies,^{7,29} adolescents who have frequent family meals had healthier profiles overall, including higher SES, and greater parent communication, F/V availability, and accessibility; parenting modeling of F/V intake; and encouragement for healthy eating. Family meals may encourage or be the result of other healthful practices (eg, family meals lead to more F/V in the house or vice versa), or be influenced by additional factors, such as overall parenting style.³⁰ However, differences emerged when interactions between family meal frequency and parenting practices were explored and these differences provide guidance on what might be helpful in the situation where adolescents do not have regular family meals.

Interestingly, when healthful parenting practices were low, family meals did not have a positive association with F/V intake. Conversely, mean servings of F/V were highest for adolescents who had both frequent family

meals and healthful parenting practices. F/V intake might be highest when adolescents have frequent family meals and other healthful parenting practices because healthier meals are served by families that engage in other healthful practices (eg, have F/V available).³¹ To determine how changes in family meals and other parenting practices influence adolescent F/V intake, the relative importance of family meals and other F/V-related parenting practices needs to be further tested in longitudinal and intervention studies. Additional research is also needed that identifies how health professionals and others who work with parents and families can best support parents to adopt healthful parenting practices.

Another interesting pattern that emerged was that F/V intake was higher for adolescents who report infrequent family meals but are exposed to high levels of other healthful parenting practices compared to adolescents who report frequent family meals but are not exposed to other healthful parenting practices. This pattern was true for each parenting practice examined, except parental encouragement for healthy eating and parental communication. Perhaps it is not surprising that the parenting practices specific to F/V were found to be more closely related to adolescent F/V intake than family meals, meals that may or may not have included healthy foods. Conversely, parent communication was only associated with greater F/V intake when family meals were frequent. A similar construct, family cohesion, has previously been shown to mediate the relationship between family meals and diet quality.³² Family meals may lead to more connected and communicative families, which, in turn, may lead to more positive experiences and attitudes toward healthful eating.¹⁹

Strengths of this study include its large, diverse, population-based sample of adolescents and the examination of multiple parenting practices in conjunction with family meal frequency. This study did not examine other parenting factors that may influence F/V intake, such as the amount or variety of healthful foods offered in the home and the quality of family meals (eg, healthfulness or preparation method of the foods served).² Other limitations to consider when interpreting study findings include mismatch in the time period assessed for some measures (eg, FFQ assessed over one year, family meals assessed over the past week), the cross-sectional nature of the analyses, and the use of self-reported measures, including dietary intake, that may introduce social desirability bias, recall bias, and systematic measurement error. Furthermore, parenting practices were assessed by adolescent self-report, potentially introducing error if adolescent reports were inaccurate. However, adolescent report may be less prone to social desirability bias than parent report,³³ and adolescent perceptions might be more closely tied to their behavior.³⁴ Concordance of parenting practices were not explored, but it should be noted that families with discordant practices (eg, mother but not father models healthful eating) may have attenuated the results, while families with concordant practices (eg, both mother and father model healthful eating) may have seen even greater benefits to adolescent F/V intake. Future research should examine comparisons by same-sex and opposite-sex parent–child dyads.

CONCLUSIONS

Healthful parenting practices (F/V availability and accessibility, parent F/V modeling, and encouragement of healthy eating) and regular family meals were associated with higher F/V intake in adolescents. F/V intake was highest in adolescents who were exposed to both healthful parenting practices and regular family meals. However, in the absence of healthful parenting practices, family meals were no longer associated with greater F/V intake. Family meals may be most helpful in conjunction with other F/V-related parenting practices; however, further research is needed that evaluates the impact on adolescent F/V intake of targeting both family meals and other parenting practices, such as healthy home food availability and accessibility and modeling and encouragement of desired behaviors.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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