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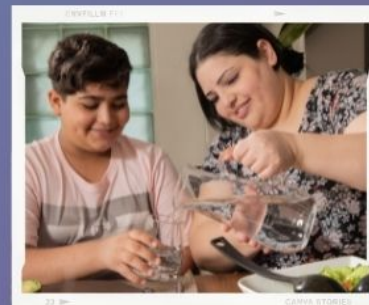
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All in the Family: Correlations Between Parents' and Adolescent Siblings' Weight and Weight-Related Behaviors

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Objective: To examine whether and how parents' and adolescent siblings' weight and weight-related behaviors are correlated. Results will inform which family members may be important to include in adolescent obesity prevention interventions.

Methods: Data from two linked population-based studies, EAT 2010 and F-EAT, were used for cross-sectional analyses. Parents ($n = 58$; 91% females; mean age = 41.7 years) and adolescent siblings (sibling #1 $n = 58$, 50% girls, mean age = 14.3 years; sibling #2 $n = 58$, 64% girls, mean age = 14.8 years) were socioeconomically and racially/ethnically diverse.

Results: Some weight-related behaviors between adolescent siblings were significantly positively correlated (i.e., fast food consumption, breakfast frequency, sedentary patterns, $p < 0.05$). There were no significant correlations between parents' weight and weight-related behaviors and adolescent siblings' same behaviors. Some of the significant correlations found between adolescent siblings' weight-related behaviors were statistically different from correlations between parents' and adolescent siblings' weight-related behaviors.

Conclusions: Although not consistently, adolescent siblings' weight-related behaviors were significantly correlated as compared with parents' and adolescent siblings' weight-related behaviors. It may be important to consider including siblings in adolescent obesity prevention interventions or in recommendations healthcare providers give to adolescents regarding their weight and weight-related behaviors.

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Introduction

According to the recent Census in the United States (2010) (1), the average US family has approximately four family members in the household, with over 65% of families having more than one child in the same household. Given how common it is for adolescents to live with multiple family members (i.e., parents, siblings), and the known high prevalence of adolescent obesity (2,3), it is important to understand whether and how multiple family members' behaviors are related to adolescents' weight and weight-related behaviors (e.g., fruit and vegetable intake, physical activity, screen time). Additionally, sibling influences on adolescent weight-related behaviors are key to investigate because sibling relationships are the longest lasting relationships (4), in terms of life expectancy, and may have the most sustained influence on adolescents' weight-related behaviors as adolescents transition into adulthood.

While it is recognized that the "family" influences adolescents' weight and weight-related behaviors (e.g., dietary intake, physical

activity, sedentary behaviors), the majority of studies have investigated only the parent and adolescent relationship (5). Very limited research has investigated how multiple family members' weight and weight-related behaviors are associated with adolescents' weight, dietary intake, and physical activity (5,6). For example, it is unknown whether siblings' or parents' weight and weight-related behaviors are more highly correlated with adolescents' weight, dietary intake, and physical activity (5). Addressing these types of questions will help to identify key family member(s) whose own behaviors are associated with adolescents' weight and weight-related behaviors, thus informing which family member(s) may be important to include in obesity prevention interventions.

Numerous previous studies have examined parental influences on adolescent obesity risk (5,7-10). Parent feeding practices (i.e., restriction, pressuring) (11-14), parenting style (i.e., authoritative, authoritarian, permissive, neglectful) (7,15-17), frequent family meals (18-20), and parent modeling and encouraging of healthful behaviors (21-23) have all been examined in regards to childhood

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obesity risk. Results suggest that restrictive parent feeding practices are associated with increased obesity risk (11-14) and authoritative parenting style (7,15-17) and frequent family meals (18-20) are associated with more healthful dietary behaviors and reduced risk of obesity, although findings have not always been consistent (24). However, the associations between parent modeling healthful eating and physical activity behaviors and adolescents' weight and weight-related behaviors are less clear. For example, some studies have shown associations between parent modeling of healthful eating and physical activity and adolescent lower body mass index (BMI) z-score and more healthful dietary intake and hours of physical activity (25,26) and other studies have shown few or no significant associations (27,28).

While numerous studies have been conducted in the field of family studies and psychology regarding the influence of siblings on adolescent delinquency, depression, risk taking behaviors (e.g., smoking, drinking, drugs, risky sexual behavior), and peer competency (i.e., ability to relate and be accepted by peers) (29-31), very limited research has examined the association between siblings' and adolescents' weight and weight-related behaviors. The majority of sibling research has been conducted on twins investigating similarities on weight status (32,33), chronic health conditions (e.g., diabetes, high blood pressure) (34-36), and disordered eating behaviors (37-39). Findings show that twins typically have similar weight status, risk factors for chronic disease, and disordered eating behaviors, but it is unclear whether twins have similar weight-related behaviors (e.g., dietary intake, physical activity) (23-30). One study that did look specifically at sibling influences on adolescent weight, physical activity, and dietary behaviors examined associations between sibling closeness and conflict and adolescents' health attitudes, exercise behaviors, and weight status above and beyond parent-child relationship qualities (6). Results showed that sibling closeness was positively associated with adolescents' health attitudes and exercise behaviors after controlling for parent-child relationship qualities and individual characteristics such as temperament (6).

The current study will examine correlations between parents' and adolescent siblings' weight and weight-related behaviors in order to address gaps in the previous literature related to parent modeling of dietary and physical activity patterns and the understudied influence of siblings. Additionally, birth order of siblings will also be examined to understand the relationship between older and younger siblings' weight and weight-related behaviors. This multi-informant familial data, representing a diverse ethnic/racial and socioeconomic sample, will allow for determining key family members who may be important to include, or whose relationships would be important to address, in adolescent obesity prevention interventions.

Family Systems Theory (40) guides the hypotheses and data analysis plan for the current study. Family Systems Theory recognizes multiple familial influences on youth weight and weight-related behaviors and posits that a change in one part of the family system affects other parts of the system. For example, if a sibling is physically active and eats healthfully this may promote physical activity and healthful eating in the adolescent. This study proposes to examine whether certain family members' (i.e., siblings) weight and weight-related behaviors are more highly correlated with adolescent weight and weight-related behaviors than others (i.e., parents). The main study hypotheses include: (1) Adolescent siblings' weight and weight-related behaviors (i.e., fruit and vegetable intake, fast food

consumption, sugar-sweetened beverage consumption, breakfast frequency, physical activity, sedentary behavior, dieting) will be more significantly correlated compared to parents' and adolescent siblings' weight and weight-related behaviors; and (2) Weight and weight-related behaviors among older siblings will be more significantly correlated with adolescents' weight, dietary intake and physical activity as compared to weight and weight-related behaviors among younger siblings.

Methods

Study design and population

Data for this analysis were drawn from two coordinated, population-based studies (22). EAT 2010 (Eating and Activity in Teens) was designed to examine dietary intake, physical activity, weight control behaviors, weight status, and factors associated with these outcomes in adolescents. Project F-EAT (Families and Eating and Activity Among Teens) was designed to examine factors within the family and home environment (e.g., parent behaviors, family functioning, home food, and physical activity resources) of potential relevance to adolescents' weight and weight-related behaviors. Survey development for both EAT 2010 and F-EAT are described elsewhere (22). Drafts of the surveys were pre-tested by 56 adolescents and 35 parents from diverse backgrounds for clarity, readability, and relevance; and reviewed by an interdisciplinary team of experts. After revisions, the survey was additionally pilot tested with a different sample of 129 middle school and high school students and 102 parents to examine the test-retest reliability of measures over a one- to two-week period. All study procedures were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee and the participating school districts.

For EAT 2010, surveys and anthropometric measures were completed by 2,793 adolescents from 20 public middle schools and high schools in the Minneapolis/St. Paul metropolitan area of Minnesota during the 2009-2010 academic year. For Project F-EAT, data were collected by surveying up to two parents/caregivers ($n = 3,709$) of the adolescents in EAT 2010 by mail or phone interviews. In total, 2,382 EAT 2010 (85%) adolescent participants had at least one parent respond and there were two parent respondents for 1,327 adolescents.

The study sample for the current analysis was restricted to those adolescents with a sibling in the EAT survey that also had the same primary parent reporting in the F-EAT survey. Pairs of siblings were identified through the matching of addresses and birth dates of parent-respondents in the F-EAT survey. Adolescents that did not live with their primary parent at least half of the time were not included in the analysis. The final sample (Table 1) included 58 triads of two adolescent siblings and their primary parent. The first siblings of the pair to participate in the survey were equally split by gender (50%), racially diverse (White - 14%; Black - 15%; Hispanic - 19%; Asian American - 28%; Native American/Other - 24%), with a mean age of 14.3 years. The second siblings of the pair to enroll in the survey were 64% female, similarly racially diverse (White - 14%; Black - 15%; Hispanic - 19%; Asian American - 26%; Native American/Other - 22%), with a mean age of 14.8 years. Primary parents were predominantly female (91%), racially diverse (White - 22%; Black - 19%; Hispanic - 21%;

TABLE 1 Descriptive statistics of sibling and parent demographics, weight status, dietary intake, physical activity, and dieting

	Sibling 1 (n = 58)	Sibling 2 (n = 58)	Primary parent (n = 58)
Age (# years)	14.3 (2.1)	14.8 (2.1)	41.7 (6.9)
Female	50% (29)	64% (37)	91% (53)
Race			
White	14% (8)	14% (8)	22% (13)
Black	15% (9)	15% (9)	19% (11)
Hispanic	19% (11)	19% (11)	21% (12)
Asian American	28% (16)	26% (15)	26% (15)
Hawaiian/Native American/other	24% (14)	22% (13)	10% (6)
Parent education			
Less than high school	-	-	31% (18)
High school/GED	-	-	19% (11)
Some college	-	-	26% (15)
Finished college	-	-	14% (8)
Advanced degree	-	-	9% (5)
Overweight/obese	38% (22)	41% (24)	66% (38)
Fruits and vegetables (servings/day)	2.8 (1.9)	2.5 (1.8)	7.7 (2.1)
Fast food (# times/wk)	1.5 (0-9)	1.5 (0-5.5)	0.75 (0-5.5)
Sugary beverages (#/day)	0.5 (0-2.4)	0.2 (0-4.1)	1.75 (0-14)
Breakfast (#/wk)	4.5 (2.7)	4.5 (2.5)	4.7 (2.2)
Physical activity (hrs/wk)	4.6 (0-16)	2.6 (0-16)	3.1 (0-13.3)
Sedentary activity (hrs/wk)	34.3 (24.1)	38.9 (26.6)	13.5 (9.2)
Dieting	31% (18)	33% (19)	50% (29)

Values presented as mean (standard deviation), median (range), or % (n). Frequencies may not sum to total due to missingness.

Asian American – 26%; Native American/Other – 10%), 50% completed some college or more, with a mean age of 41.7 years.

Measures

All parent and adolescent siblings’ weight and weight-related behaviors (i.e., fruit and vegetable intake, fast food consumption, sugar-sweetened beverage intake, breakfast frequency, dieting, physical activity, sedentary behaviors) used in analyses are described in Table 2.

Statistical analyses

Descriptive statistics were calculated for relevant study variables including means and standard deviations for continuous variables and frequencies and percentages for categorical variables (Table 1). To evaluate the strength of associations between parent and child or between siblings for the outcome of interest (e.g., amount of weekly physical activity), correlations were estimated by fitting models using generalized estimating equations (GEE) with a second-degree stationary (Toeplitz) working correlation matrix. This correlation matrix specifies two separate correlation parameters: one parameter models the correlation between outcomes for the first and second sibling; a second parameter models correlation between outcomes for parent and sibling. The correlation between parent and sibling 1 and the correlation between parent and sibling 2 are assumed to be identical in this working correlation matrix. Continuous dependent variables (e.g., weekly hours of physical activity, weekly hours of

sedentary activity, daily servings of fruits and vegetables, weekly frequency of fast food consumption, daily consumption of sugary beverages, and weekly frequency of eating breakfast) were modeled as the dependent variable with separate linear regressions.

Adolescent BMI percentile was dichotomized to overweight/obese vs. nonoverweight, using a cut-point of greater than or equal to the 85th percentile. Parent BMI (kg/m²) was dichotomized to overweight/obese vs. nonoverweight using a cutpoint of greater than or equal to 25 (kg/m²). Weight status and dieting, both dichotomous variables, were modeled using GEE logistic regression. All models included an indicator term for the primary parent, a term for age (continuous), a term for gender (female/male), and indicator variables for race/ethnicity (White/African American/Hispanic/Asian American/Hawaiian, Native American, Other).

To test if the correlation terms were statistically different from zero or from each other, a cluster bootstrap procedure was implemented to estimate the standard error of the correlations as well as the difference between the correlations. The bootstrap was implemented for 5,000 iterations and 95% CI were estimated based on percentiles of the bootstrap distribution. Tests of significance were based on whether the percentile interval of interest included the null hypothesis.

To investigate potential interactions between birth order of the adolescent and their sibling on outcomes, we examined interactions between birth order (whether the sibling was older/younger than the

TABLE 2 Adolescent, parent, and sibling weight and weight-related behaviors used in analyses

Measure	Description/questions
BMI, Dietary Intake Patterns, Unhealthy Weight Control Behaviors and Physical Activity Patterns	
Body mass index (BMI) percentile	<p>Adolescent and sibling height and weight measurements were taken at school by trained research staff in a private area with standardized equipment and procedures. Adolescents were asked to remove shoes and outerwear (e.g., heavy sweaters). BMI values were calculated according to the following formula: weight (kilograms)/height (meters)² and converted to percentiles, standardized for gender and age based on CDC guidelines (66,67).</p> <p>Parent BMI was assessed using parent self-report of height and weight (test-retest $r = 0.97$). Self-reported height and weight has been shown to be highly correlated with objectively measured values in adults (68-71). BMI was calculated using the standard formula, weight (kilograms)/height (meters)² and taking the average between both surveys filled out for siblings.</p>
Fruit/vegetable intake and sugar-sweetened beverage consumption	<p>Adolescent and sibling dietary intake was assessed with the 149-item Youth and Adolescent Food Frequency Questionnaire (YAQ) (72). For fruit and vegetable intake, daily servings were defined as the equivalent of one-half cup. A serving of sugar-sweetened beverages (e.g., soda pop, sports drinks) was defined as the equivalent of one glass, bottle, or can. Validity and reliability of the YAQ have been previously tested with youth and found to be within acceptable ranges for dietary assessment tools (72,73). Responses to questions on the frequency of intake of fruits ($n = 14$; excluding fruit juice) and vegetables ($n = 20$; excluding french fries) were summed to assess average total daily intake.</p> <p>Parent fruit and vegetable intake was assessed by asking parents the following two questions, "How many servings of fruit did you usually eat on a typical day? (A serving is a half-cup of fruit or 100% fruit juice or a medium piece of fruit)" and "Thinking back over the past week, how many servings of vegetables did you usually eat on a typical day? (A serving is half a cup of cooked vegetables or one cup of raw vegetables)." For both items, there were seven response options (0, <1, 1, 2, 3, 4, 5, or more servings/day) (test-retest $r = 0.69$ [fruit]; $r = 0.57$ [vegetables]). Responses for fruit and vegetable intake were coded numerically as 0, 0.5, 1, 2, 3, 4, and 5.5, then summed together to create one variable. Parent sugar-sweetened beverage consumption was assessed by asking parents, "Thinking back over the past week, how often did you drink sugar-sweetened beverages (regular soda, pop, Kool-Aid)?" Response options included: less than once per week, 1 drink per week, 2-4 drinks per week, 5-6 drinks per week, 1 per day, or 2 or more per day (test-retest $r = 0.66$). Responses were coded numerically as 0, 1.5, 3, 5.5, 7, and 14, then divided by 7 for daily sugary beverage intake. Parent's values were averaged between survey responses filled out for both siblings.</p>
Breakfast frequency	<p>Parents, adolescents, and siblings were asked: "During the past week, how many days did you eat breakfast?" Response options ranged from never to every day. Responses were coded numerically as: 0, 1.5, 3.5, 5.5, and 7 days per week (test-retest breakfast $r = 0.82$ [parent]; $r = 0.76$ [adolescent/sibling]). Parent values were averaged between survey responses filled out for both siblings.</p>
Fast food intake	<p>Parents, adolescents, and siblings were asked: "In the past week, how often did you eat something from the following types of restaurants (like McDonald's Burger King, Hardee's, etc.)?" Response options were never, 1-2 times, 3-4 times, 5-6 times, 7 times, and more than 7 times. Responses were scored as: 0, 1.5, 3.5, 5.5, 7, and 9 times per week (test-retest $r = 0.55$ [parent]; $r = 0.38$ [adolescent/sibling]). Parent values were averaged between survey responses filled out for both siblings.</p>
Dieting	<p>Parent, adolescent, and sibling dieting was assessed by self-report using the following question, "How often have you gone on a diet during the last year? By 'diet' we mean changing the way you eat so you can lose weight (74)." Responses included: never, one to four times, 5 to 10 times, more than 10 times, and I am always dieting (test-retest = 0.60 [parent]; $r = 0.65$ [adolescent/sibling]). To distinguish dieters from non-dieters, responses were dichotomized into no (never) and yes (other responses). Sensitivity analyses indicated that collapsing the dieting variable produced similar results as the original 5-item scale. Parent responses were coded to yes if they reported they had ever dieted in either survey filled out for siblings and no if they answered never to both surveys filled out for siblings.</p>
Physical activity	<p>Parent, adolescent, and sibling physical activity questions were adapted from the Godin Leisure-Time Exercise Questionnaire (75). EAT 2010 adolescents were asked: "In a usual week, how many hours do you spend doing the following activities: (1) strenuous exercise (e.g., biking fast, aerobics, jogging, basketball, swimming laps, soccer, rollerblading) (2) moderate exercise (e.g., walking quickly, easy bicycling, volleyball, skiing, dancing, skateboarding, snowboarding)." Response options ranged from "none" to "6+ hours a week." (test-retest $r = 0.78$ [parent]; $r = 0.73$ [adolescent/sibling]). Items were summed together to assess average hours of moderate and vigorous physical activity per week. Parent values were averaged between survey responses filled out for both siblings.</p>

TABLE 2. (continued).

Measure	Description/questions
Sedentary behavior	Adolescents and siblings were asked, "In your free time on an average weekday (Monday–Friday), how many hours do you spend doing the following activities? . . . [0 h, 1/2 h, 1 h, 2 h, 3 h, 4 h, 5+ h] (76)." The activities assessed included: Watching TV/DVDs/videos, using a computer (not for homework), and Xbox/Play Station/other electronic games that you play when sitting (test-retest $r = 0.84$). Participants who reported 5+ hours of use were coded as having 6 h. Total sedentary behavior per week was calculated as the sum of the three individual behaviors per week. Parents were asked, "On an average day, how many hours do you spend watching TV, DVDs, or videos? [none, 1/2 h per day, 1 h per day, 2 h per day, 3 h per day, 4 h per day, 5 or more h per day]." (test-retest $r = 0.78$). Parent values were averaged between survey responses filled out for both siblings.
Control variables	
Sociodemographic characteristics	Parent, adolescent, and sibling race/ethnicity, age, and parents' educational attainment were assessed by self-report in adolescents and parents, respectively. Race/ethnicity was assessed with the item, "Do you think of yourself as (1) white, (2) black or African American, (3) Hispanic or Latino, (4) Asian American, (5) Hawaiian or Pacific Islander, or (6) American Indian or Native American?" and respondents were asked to check all that apply. Participants who checked "white" and another option were included in the "other" category. Those who checked two non-white options were categorized as "mixed/other race." Additionally, those checking "Hawaiian/Pacific Islander" or "American Indian/Native American" were also categorized as "mixed/other race" due to their small numbers in this data set. Highest level of parent educational attainment was used as a proxy for socio economic status and was assessed using the following question, "What is the highest level of education that you have completed?" Response options for education included: less than high school; finished high school or GED; some college; finished college; advanced degree. Those who finished college or completed advanced degrees were combined in analyses for a total of 4 categories (77). Parent, adolescent, and sibling age was calculated using self-reported birth date and survey completion date.

target adolescent) and the independent sibling variables. There were no statistically significant interactions found; final models did not include an interaction term.

Results

Overall, results indicated that some weight-related behaviors (i.e., fast food consumption, breakfast frequency, sedentary behaviors) between siblings were significantly positively correlated. Additionally, there were no significant correlations between parents' weight and weight-related behaviors and adolescent siblings' weight and weight-related behaviors (Table 3). Furthermore, some significant correlations between adolescent siblings' weight-related behaviors were significantly different from parents and adolescent siblings' weight-related behaviors.

Weight status

Adolescent siblings' weight status was not significantly correlated, after adjusting for adolescent age, gender, and race/ethnicity. Additionally, parent and adolescent siblings' weight status was not significantly correlated (Table 3).

Dietary patterns

Adolescent siblings' fast food consumption and breakfast frequency were significantly positively correlated, after adjusting for adolescent age, gender, and race/ethnicity (Table 3). There were no significant correlations between siblings' fruit and vegetable intake. In addition, there were no significant correlations between parent fruit and vegetable intake, fast food consumption, breakfast frequency,

sugar-sweetened beverage consumption and adolescent siblings' same behaviors. The correlation between adolescent siblings' fast food consumption significantly differed from the correlation between parents' and adolescent siblings' fast food consumption (Table 3).

Physical activity patterns

Siblings' hours of sedentary behavior per week were significantly positively correlated, after adjusting for adolescent age, gender, and race/ethnicity (Table 3). There was not a significant correlation between parents' hours of sedentary behaviors per week and adolescent siblings' sedentary behaviors per week. Additionally, the significant positive correlation between siblings' sedentary patterns was significantly different from the correlation between parents' and adolescent siblings' sedentary patterns. There were no significant correlations between siblings' hours of physical activity or parents' and siblings' hours of physical activity (Table 3).

Dieting

Adolescent siblings' dieting behaviors were not significantly correlated, after adjusting for adolescent age, gender, and race/ethnicity. Additionally, parent and adolescent siblings' dieting behaviors were not significantly correlated (Table 3).

Interaction by sibling birth order

There were no statistically significant interactions by birth order of the sibling. This suggests that all siblings' weight and weight-related behaviors found to be significantly correlated were not driven by whether the sibling was younger or older.

TABLE 3 Correlations between parent and adolescent and between sibling weight status, dietary intake, physical activity, and dieting^a

	Parent and adolescent correlation coefficient ^b	Siblings correlation coefficient ^b	Difference in correlations (95% CI) ^b
Weight status	0.07 (−0.17, 0.25)	0.25 (−0.10, 0.54)	−0.18 (−0.56, 0.17)
Fruits and vegetables	0.08 (−0.17, 0.29)	0.16 (−0.17, 0.40)	−0.07 (−0.48, 0.37)
Fast food	0.22 (−0.02, 0.40)	0.65 (0.17, 0.88)	−0.43 (−0.71, −0.02)
Sugary beverages	0.20 (−0.15, 0.35)	0.05 (−0.01, 0.17)	0.15 (−0.28, 0.30)
Breakfast	0.19 (−0.07, 0.40)	0.45 (0.11, 0.69)	−0.26 (−0.60, 0.10)
Physical activity	0.07 (−0.13, 0.25)	0.14 (−0.28, 0.48)	−0.07 (−0.55, 0.46)
Sedentary activity	0.02 (−0.15, 0.13)	0.65 (0.04, 0.94)	−0.63 (−0.90, −0.05)
Dieting	0.20 (−0.05, 0.40)	0.19 (−0.12, 0.46)	0.00 (−0.35, 0.35)

^aAll models adjusted for parent and adolescent race, gender, and age and an indicator variable for primary parent.

^bCorrelation coefficients and differences in correlation coefficients are observed values; 95% confidence intervals (CI) were calculated using 5,000 cluster bootstrap samples and percentiles of the bootstrap distribution.

Bolded values are significant at $\alpha < 0.05$ using bootstrap percentiles.

Discussion

The results of this study suggest that some weight-related behaviors between siblings are highly correlated, for better or for worse. For example, adolescent siblings' breakfast eating frequency was significantly positively correlated (i.e., when one adolescent ate breakfast it was highly likely the other adolescent also ate breakfast). However, siblings' fast food intake and sedentary activity behaviors were also significantly positively correlated. This finding supports limited previous research showing that siblings' weight and health attitudes are similar (6). Because many of the significant correlations between siblings in this study were unhealthful behaviors (i.e., fast food consumption, sedentary behavior), it may be important for future interventions to include both siblings when trying to combat negative health behaviors in the home environment. Family Systems Theory (40) would support this recommendation, in that targeting both siblings would increase the likelihood that both siblings would engage in more healthful behaviors through reciprocally reinforcing each other's positive weight-related behaviors (and potentially other family members' weight-related behaviors too).

While not all correlations were significantly different, results of this study indicated that adolescent siblings' weight-related behaviors were more significantly correlated as compared to parents' and adolescent siblings' weight-related behaviors. This finding may be important for researchers and practitioners who work with families with adolescent siblings. It may be the case that involving siblings in adolescent obesity prevention efforts would be helpful, potentially even more than parent's involvement.

Another interesting finding from the current study was that the interaction between sibling birth-order was not significant. Previous literature in the fields of family studies and psychology suggests that older siblings are more influential on adolescent health attitudes, risk taking behaviors and depressive symptoms (6). This is an interesting finding and may indicate that with regard to targeting adolescent weight-related behaviors it is equally useful to involve a younger or older sibling. However, our limited sample size may have prevented us from detecting an interaction even if one existed.

Results of this study indicate the potential importance of siblings in understanding adolescents' weight-related behaviors. Future research is needed that incorporates mixed methods designs (i.e., qualitative and quantitative) in order to examine more in-depth the multiple relationships in the home environment and the role of each family member in regards to adolescents' weight and weight-related behaviors. Additionally, mixed methods designs would be able to investigate further why siblings' weight-related behaviors are more significantly correlated with adolescents' weight-related behaviors as compared to parents. Such information would inform future adolescent obesity prevention interventions by being able to target the family relationships that may have the most influence on changing adolescents' weight and weight-related behaviors.

There were several strengths and limitations of the current study that need to be taken into account when interpreting findings. Strengths of the study include drawing from a large and diverse community-based epidemiological cohort study. Additionally, family triads (parent, adolescent, sibling) were studied, which is rarely done in the obesity field. Furthermore, all participants self-reported on their weight-related behaviors. One limitation of the study is that, in order to match parent, adolescent and sibling triads, the sample size was greatly reduced and we may have had less power in analyses. Further, results may be less generalizable in terms of race and ethnicity in comparison to the overall Project EAT sample.

Conclusion

The complexity of relationships in the home environment is an under-researched area in relation to adolescent obesity and has been a barrier to the progress of the field in understanding the connection between the home environment and adolescent obesity and translating findings into successful interventions. The current study indicates that some of adolescent siblings' weight-related behaviors are significantly positively correlated as compared to parents' and adolescents' weight-related behaviors. Thus, public health researchers and practitioners who work with adolescents may want to consider

including adolescents' siblings when targeting adolescents' weight and weight-related behaviors. **O**

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