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The relationship between adolescents' and their friends' eating behaviors - breakfast, fruit, vegetable, whole grain, and dairy intake

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Abstract

The purpose of this study was to examine associations between adolescents' and friends' healthy eating behaviors, specifically breakfast, fruit, vegetable, whole grain and dairy food intake as reported by both adolescents and their friends. Data for this study were drawn from EAT-2010 (Eating and Activity among Teens), a population-based study examining multi-level factors of eating, physical activity, and weight-related outcomes among adolescents (80% racial/ethnic minority) in Minneapolis/St. Paul, Minnesota during the 2009–2010 academic year. In-class surveys were completed by 2043 adolescents in 20 schools. Adolescents identified friends from a class roster; friends' survey data were then linked to each participant. Generalized estimating equation linear regression models were used to examine associations between adolescents' healthy eating behaviors and these behaviors from their friends (friend group and best friends), adjusting

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for socio-demographic characteristics. Significant positive associations were found for breakfast eating between adolescents and their friend groups and best friends (friend groups $\beta=0.26$, $p<0.001$; best friends $\beta=0.19$, $p=0.004$), as well as for whole grain (friend groups $\beta=0.14$, $p<0.001$; best friends $\beta=0.13$, $p=0.003$) and dairy food intake (friend groups $\beta=0.08$, $p=0.014$; best friends $\beta=0.09$, $p=0.002$). Adolescents' and their best friends' vegetable intake were also significantly related ($\beta=0.09$, $p=0.038$). No associations were seen among friends for fruit intake. Findings from this study suggest that adolescent friends exhibit similarities in healthy eating patterns. Dietitians and health professional may consider developing strategies to engage friends to promote adolescents' healthy dietary behaviors.

Keywords

adolescents; friends; healthy eating behaviors

Introduction

Meal patterns and dietary intake during adolescence are of critical importance for growth and development, a healthy body weight, and short and long-term health^{1,2}. Factors associated with healthy eating behaviors during adolescence include healthy food at school³, parental modeling,^{4,5} and taste preferences.⁶ Although the foundation for eating behaviors begins during childhood,^{1,2} these behaviors continue to evolve as individuals broaden their social networks and assume greater independence. However, little research has examined if adolescents' healthy eating behaviors are associated with similar behaviors in their friends. Given the importance of friends during adolescence,⁷ an opportunity may be missed to learn more about factors related to young people's eating patterns. Understanding similarities and differences between friends with regard to their eating behaviors can help inform the design of nutrition interventions for youth.

Most research to date relies on participants' self-reports of their friends' behaviors.^{8,9} Studies have suggested that adolescents' perceptions about their friends' weight-related attitudes and behaviors predict body dissatisfaction, dieting onset, chronic dieting, unhealthy weight control behaviors and eating disorder symptoms.¹⁰⁻¹² Perceptions of friends' behavior may not reflect the friends' actual behavior as these perceptions may be altered by an individual's own attitudes and beliefs.¹³ Studies with direct measures have generally focused on the negative impact that friends have on adolescent eating patterns;¹⁴ very little has been done to investigate the positive effect that friends might exert during adolescence, particularly on healthy eating behaviors. To our knowledge, measures of friends' healthy eating behaviors have been examined in just one study, which had null findings.¹⁵ Specifically, Ali et al found that over time, friends' sports, exercise, and fast food eating behaviors were linked to adolescent behaviors, but not healthy eating outcomes such as breakfast, fruit, and vegetable consumption. These findings have not been replicated.

Several well-established healthy eating behaviors include regular breakfast, fruit, vegetable, whole grain and dairy food consumption. Despite the known benefits of consuming these foods, few adolescents consume recommended levels.¹⁶⁻¹⁹ There is substantial national agreement on improving frequency/intake of breakfast, fruits, vegetables, whole grains, and low-fat dairy among youth.²⁰⁻²² A better understanding of factors related to these healthy eating behaviors is needed to help guide intervention development to decrease risk of chronic disease and obesity. On order to help understand the role that friends have on adolescent healthy eating behaviors, this study sought to examine associations between adolescents' and friends' healthy intake among a large, diverse sample using direct measures of friends' behaviors.

Methods

Study design

Data for this study were drawn from EAT-2010 (Eating and Activity in Teens), which examined eating behaviors, physical activity patterns, and weight-related outcomes among 2793 adolescents.²³ Youth (mean age 14.4 ± 2.0 years) from 20 Minneapolis/St. Paul middle schools and high schools completed in-class nutrition and nominated friend surveys. Trained staff measured height and weight, and administered surveys in required health or physical education classes over two to three visits. Parental consent was received by each student under 18 at least 10 days prior to data collection. During data collection, participating students provided assent and received a \$10 gift card. The University of Minnesota's Institutional Review Board Human Subjects Committee and the school districts' research boards approved all study protocols.

EAT-2010 student survey—The student survey was a 253-item self-report instrument assessing a range of factors of potential relevance to weight status and weight-related behaviors among adolescents. Survey development was initially guided by a review of previous Project EAT surveys^{23–25} to identify the most salient items, and a theoretical framework which integrates an ecological perspective²⁶ with the social cognitive theory.²⁷

Young adult food frequency questionnaire (YAQ)—Dietary intake was assessed with the 152-item youth version of the Willett food frequency questionnaire, the Youth/Adolescent Food Frequency Questionnaire (YAQ), which has undergone extensive testing for validation and reproducibility in adolescents.^{28,29} This instrument was used successfully in previous waves of Project EAT,³⁰ and offers the most suitable mechanism for examining dietary intake in a large, diverse population of adolescents.

Friend nomination—An assessment of friends through the collection of friendship nominations was included as a survey instrument, as has been done in previous studies.^{31–33} Lists of all students in each grade were obtained in advance of data collection from each school. Rosters were compiled for each school and study staff created a unique 4-digit network identification (ID) number for each enrolled student in the school. Adolescent participants were provided with the rosters containing the names and corresponding IDs of all other students in their school, alphabetized and separated by grade level. Participants identified, recorded, and ranked the IDs of their three closest female friends and three closest male friends from the roster, in order of closeness. Students were permitted to nominate fewer than six friends, and indicate if they had close friends who did not attend their school. Nominated friends not attending surveyed schools or within classrooms that were surveyed were not included in the sample design. Participants nominated an average of 5.2 ± 1.3 (out of 6) friends and an average of 2.1 ± 1.7 of those friends provided data through the EAT-2010 study design. Overall, 77% of the original sample of adolescents had at least one friend in the dataset ($n=2126$). In addition, some students were absent or were unable to complete the YAQ and/or reported biologically implausible caloric intake ($n=83$); thus, the analytic sample for this study is slightly smaller ($n=2043$).

Measures

Healthy eating behaviors—Five variables assessed healthy food intake among adolescents and their friends. *Breakfast eating* was assessed on the EAT-2010 student survey: “During the past week, how many days did you eat breakfast?” (response options: “Never,” “1–2 days,” “3–4 days,” “5–6 days,” “Every day”) (test-retest $r=0.76$)²⁵ and was recoded to days per week. Adolescents self-reported their *fruit*, *vegetable*, *whole grain*, and *dairy food intake* on the YAQ by responding to the question: “Think about your usual eating

habits over the past year. About how often do you eat each of the following foods and beverages?" *Fruit intake* (excluding juice) was assessed with 11 items such as grapes, bananas, and strawberries. *Vegetable intake*, excluding french fried potatoes, included 20 types of vegetables such as string beans, mixed vegetables, and sweet potatoes. *Whole grain intake* estimated by summing the reported frequency of consuming five items including dark bread, popcorn, and breakfast cereal.¹⁸ Intake of *dairy foods* included 16 milk-based items such as milk, yogurt, pudding, cheese and ice cream. Fruits, vegetables, whole grains, and dairy foods were summed separately and data were recoded as daily servings.

Friends—Eating behaviors of each nominated friend were linked by ID number to individual students, allowing for the creation of friends' predictors unique to each participant. Independent variables were created using the same healthy eating behaviors reported by nominated friends, as described above. The *friend group* measure encompasses the mean of each healthy eating behavior examined (days of breakfast eating; servings of fruits, vegetables, whole grains, and dairy) from all friends nominated by adolescents and who provided data. The *best friends* measure was the mean reported intake from those friends whom adolescents ranked first in either gender category. The sample size for analyses with best friends was smaller given that not all participants had a male or female best friends with data (n=1371). In order to account for varying numbers of friends for each adolescent, a covariate was included consisting of *number of friends* which was a simple sum of the number of friends in the EAT-2010 dataset.

Sociodemographic characteristics—*School-level, gender, race/ethnicity, US-born status, and socioeconomic status (SES)* were all based on self-report from the EAT-2010 student survey. To create the *school-level* variable, 7th and 8th graders were classified as being in middle school and 9th–12th graders were categorized as being in high school. *Race/ethnicity* was based on the survey question: "Do you think of yourself as: 1) White; 2) Black or African America; 3) Hispanic or Latino; 4) Asian American; 5) American Indian or Native American?" Adolescents were given the option to choose more than one category, and those with multiple responses were coded as "mixed/other" for analyses. The major determinant of *SES* was the higher level of educational attainment of either parent, with adjustments made for family eligibility for public assistance, eligibility for free or reduced-cost school meals, and parental employment status.²⁵ Overall, 46% of the sample were girls, 52% were in middle school, 80% were non-white, 83% were US-born, and over 50% were from low or low-middle SES groups (Table 1).

Statistical analyses

Adolescents' eating behaviors were examined across age, gender, racial/ethnic, US-born status and SES groups; chi-square and t-tests were used to estimate whether healthy eating behaviors differed by demographic characteristics. Associations between adolescent and friend eating behaviors were examined in unadjusted analyses and in analyses adjusted for gender, socio-economic status, racial/ethnic group, US-born status, school level, and number of friends with data. Generalized estimating equation linear regression models (which accounts for clustering of students within schools) were used to estimate the association between eating behaviors among adolescents and their friends. Interactions of gender and school level by friend eating behavior were examined; no meaningful interactions were found. Thus analyses are presented unstratified. Predicted means of adolescents' healthy eating behaviors were estimated from all friends' and best friends' respective eating behaviors. Statistical significance was assessed at $p < 0.05$. All analyses were run using Stata Statistical Software: Release 10, College Station, TX: StataCorp LP, 2007.

Results and Discussion

Breakfast

Overall, the mean frequency of eating breakfast was four times per week (Table 1). Friend groups' and best friends' breakfast intake was significantly positively associated with adolescent breakfast eating (Table 2). Results indicated that on average for every additional day that an adolescent's friends (friend group) ate breakfast, that adolescent's breakfast intake was higher by 0.26 days per week. While seemingly small, at a population level this difference could potentially have large implications for overall nutrient intake in youth. Given the known benefits of breakfast,^{16,34-36} and that breakfast consumption is generally low among adolescents¹⁶, these findings could provide new intervention targets to promote breakfast consumption in youth, particularly in schools. Among the best practices to improve participation in school breakfast program are programs such as grab-n-go breakfasts and social marketing programs,³⁷⁻³⁹ which also promote positive social norms and interactions. Intervention studies that have applied these strategies have shown significant improvement in school breakfast program intake among low-income students and adolescent girls.⁴⁰ For youth and their friends, breakfast at school could be promoted as a social opportunity that could have positive nutritional benefits.

Fruits, vegetables, whole grains and dairy

Adolescents' mean daily intake of fruits was 1.3 servings and intake of vegetables was 1.4 servings (Table 1). The average intake of whole grains was 1.0 serving per day, much lower than the recommended amounts.²¹ An average of 2.6 servings of dairy were consumed per day. Among the relationships that examined adolescent and friend consumption of fruits and vegetables, only best friends' vegetable intake was significantly associated with intake of adolescents (Table 2). Adolescent vegetable intake was associated with 0.09 more servings of vegetables of for each additional serving of best friends' mean vegetable intake, which may have little practical significance despite the statistical significance. There were significant relationships between both friend groups' and best friends' and adolescents' whole grain intake (friend groups' whole grain $\beta=0.14$ and best friends' $\beta=0.13$). Similarly, friend groups' ($\beta=0.08$) and best friends' ($\beta=0.09$) dairy intake were also significantly associated to adolescents' intake, with modest effects. In a study among adults, a healthy eating pattern (fruits, vegetables, lean poultry and legumes) was found to be weakly correlated with friends' healthy eating patterns at baseline, but friends' healthy eating patterns were not predictive of adult eating over time.⁴¹ Similarly, Ali et al. reported friends' healthy eating was not associated with adolescent healthy eating over time.¹⁵ The current results are consistent with findings that friends may not exert substantial influence over adolescent fruit and vegetable consumption. However, in contrast to previous studies, the current study observed significant findings for all other healthy foods examined. Perhaps adolescent intake of fruits and vegetables would increase if fruits and vegetables were incorporated into eating behaviors that are similar among adolescents and their friends (e.g., breakfast, whole grains such as in cereals, and dairy in this study and snacks and fast food in previous studies^{14, 16,42}).

Given that no or only very small associations were seen among friends for the consumption of fruits and vegetables, and larger associations were seen for breakfast intake and whole grains perhaps among adolescents, some eating behaviors are more normative among friends while others less so. Interventions may want to target groups of friends to not only provide social support which has previously been found to be effective in promoting behavior change,^{43,44} but also social experiences for youth to interact and support each other for healthy eating. More research is needed to understand and harness the way in which friends influence adolescent eating.

This study has several strengths and limitations. It is the first study, to our knowledge, to find associations among direct measures of friends' healthy eating behaviors. Other adolescent studies have focused mostly on unhealthy eating behaviors¹⁴ and/or perceived influence of friends.⁸ The current study also included analyses of best friends, which is new to adolescent nutrition literature. In addition, this study included large proportions of youth from low SES and ethnically/racially diverse groups, who are at greatest risk for low consumption of healthy foods,^{45, 46} thus providing important insights for dietitians working with youth from these populations. A limitation of the study is that all of the results are based on self-report, and may be at risk for social desirability bias. Given the sampling design of EAT 2010, an "open" network design was used. An average of 2.1 friends per participant were in the dataset, which may be a limitation, as these friends may not be representative of an adolescent's friend group. However, given this novel, cost-saving design, unique contributions are being made to the scientific literature. In addition, there is potential for unmeasured confounding, which may bias the results. Additionally, it was not assessed whether friends were eating breakfast together, at school or otherwise. The quality of breakfast that the adolescents and their friends consumed is unknown. Finally, because these data are cross-sectional, the temporality of relationships or causality is unable to be determined. For example, based on these results, it is unknown whether adolescents simply have friends with similar breakfast eating habits, or if their friends are influencing them to have higher frequency of breakfast eating.

Conclusions

There is a need for dietitians and other health professionals to promote healthy eating adolescents for normal growth and obesity and chronic disease prevention. Data indicate that for most healthy foods examined, friends' behaviors were correlated to adolescents' eating behaviors. Given these findings, interventions programs may consider involving friends to encourage healthy eating. However, in order to develop targeted interventions, more research is needed, including longitudinal and qualitative studies, to have a clearer understanding of the mechanisms by which friends may influence adolescent eating behaviors.

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Table 1

Participant demographics and prevalence of key behavioral variables

Age (years) (<i>Mean ± SD</i>)	14.2±1.9
Gender <i>%(n)</i>	
Girls	46.2 (982)
Boys	53.8 (1143)
School level <i>%(n)</i>	
Middle school	52.5 (1100)
High school	47.5 (997)
Race/ethnicity group <i>%(n)</i>	
White	20.2 (423)
African American/Black	26.6 (557)
Latino/Hispanic	17.7 (370)
Asian American	19.4 (405)
Native American	4.1 (85)
Mixed/Other	12.0 (251)
US-born status <i>%(n)</i>	
US-born	83.2 (1742)
Foreign-born	16.8 (352)
Socioeconomic status <i>%(n)</i>	
Low	29.6 (468)
Low-middle	25.5 (236)
Middle	34.8 (183)
Upper-middle	6.9 (140)
High	3.2 (72)
Healthy eating behaviors	
Breakfast (times/week) (<i>Mean ± SD</i>)	4.2±2.6
Fruits (servings/day) (<i>Mean ± SD</i>)	1.3±1.1
Vegetables (servings/day) (<i>Mean ± SD</i>)	1.4±1.3
Whole grains (servings/day) (<i>Mean ± SD</i>)	1.0±1.1
Dairy foods (servings/day) (<i>Mean ± SD</i>)	2.6±1.8

Table 2

Adolescent healthy eating behaviors by friends' healthy eating behaviors

		Adolescent healthy eating behaviors ¹				
		Breakfast	Fruits	Vegetables	Whole grains	Dairy foods
	Sample size	Sample size ²				
Friend group	2043	β=0.26	β=0.05	β=-0.07	β= 0.14	β= 0.08
p-value		<0.001	0.160	0.136	<0.001	0.014
95% CI		0.14, 0.38	-0.02, 0.11	-0.02, 0.15	0.06, 0.23	0.02, 0.15
Best friends	1371	β=0.19	β=0.04	β= 0.09	β= 0.13	β= 0.09
p-value		0.004	0.226	0.038	0.003	0.002
95% CI		0.06, 0.32	-0.02, 0.10	0.01, 0.18	0.04, 0.21	0.03, 0.14

¹ Generalized estimating equation linear regression adjusted for race/ethnicity, socio-economic status, gender, US-born status, and number of friends with data

² Sample size varies due to fewer students completing the food frequency questionnaire (YAQ)

³ Bolded text indicates significant findings