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ARTICLE

Breakfast Eating and Weight Change in a 5-Year Prospective Analysis of Adolescents: Project EAT (Eating Among Teens)

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ABSTRACT

OBJECTIVE. Breakfast-eating frequency declines through adolescence and has been inversely associated with body weight in cross-sectional studies, with few prospective studies on this topic. This study was conducted to examine the association between breakfast frequency and 5-year body weight change in 2216 adolescents.

PATIENTS AND METHODS. Project EAT (Eating Among Teens) was a 5-year longitudinal study of eating patterns and weight concerns among adolescents. Surveys were completed in 1998–1999 (time 1) and 2003–2004 (time 2). Multivariable linear regression was used to examine the association between breakfast frequency and change in BMI, with adjustment for age, socioeconomic status, race, physical activity, time 1 BMI and breakfast category, and time 1 dietary and weight-related variables.

RESULTS. At time 1, frequency of breakfast was directly associated with intake of carbohydrate and fiber, socioeconomic status, white race, and physical activity and inversely associated with smoking and alcohol consumption and dieting and weight-control behaviors. In cross-sectional analyses at times 1 and 2, inverse associations between breakfast frequency and BMI remained largely independent of all of the confounding and dietary factors. Weight-related factors (concerns, behaviors, and pressures) explained little of the breakfast-BMI association. In prospective analyses, frequency of breakfast was inversely associated with BMI in a dose-response manner. Further adjustment for confounding and dietary factors did not seem to explain the association, but adjustment for weight-related variables seemed to partly explain this finding.

CONCLUSIONS. Although experimental studies are needed to verify whether the association between breakfast and body weight is of a causal nature, our findings support the importance of promoting regular breakfast consumption among adolescents. Future studies should further examine the role of breakfast habits among youth who are particularly concerned about their weight.

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Key Words
breakfast habits, body weight, obesity

Abbreviations
EAT—Eating Among Teens
SES—socioeconomic status
YAQ—Youth and Adolescent Food Frequency Questionnaire

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OBESITY IS ONE of the more pressing public health problems today.[1] Over the past 2 decades, the prevalence of overweight has doubled in children and nearly tripled in adolescents.[2] One intriguing line of research that may have broad public health application is the role of breakfast consumption on weight control. In children and adolescents, it is estimated that 12% to 34% regularly skip breakfast, and this percentage is found to increase with age.[3–8] Despite this finding, the relationship between breakfast consumption and body weight in children and adolescents has not been well established.

A limited number of observational studies examining breakfast habits in relation to body weight in children and adolescents have been conducted. Many cross-sectional studies,[8–15] but not all,[16–18] document an inverse association between breakfast frequency and relative body weight. Prospective studies also document an inverse association between breakfast intake and BMI[19–22] and have also found that breakfast consumption is associated with favorable nutrient intakes[3–6,10,23–26] and improved food choices,[3,26,27] especially with the inclusion of ready-to-eat breakfast cereals.[4,28–34]

Regular breakfast consumers may also benefit from physiologic mechanisms hypothesized to reduce appetite and subsequent risk of obesity (Fig 1). Weight-related concerns and perceptions are likely related to breakfast intake and

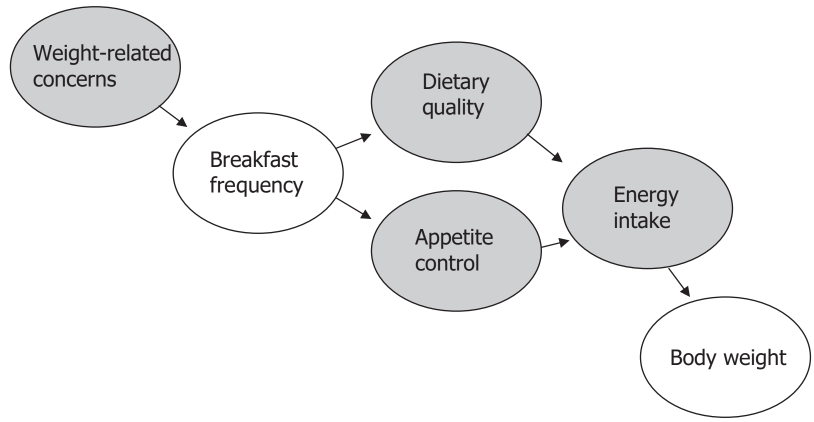

FIGURE 1
Theoretical causal model.

may play a role in the frequency with which breakfast is eaten. Breakfast frequency, in turn, may affect diet quality (eg, fiber and saturated fat intake), appetite control, and energy intake through a variety of behavioral and metabolic mechanisms.[35–41] These mechanisms may have important implications for body weight regulation.

Project EAT (Eating Among Teens), a 5-year longitudinal study, was developed to examine eating patterns and weight concerns among adolescents.[42] The purpose of the present study was to examine the association between breakfast frequency and relative body weight in both cross-sectional and prospective (5-year body weight change) analyses in adolescent males and females. We hypothesized that breakfast frequency would have an inverse association with body weight and with weight gain. Examining this question across both cross-sectional and prospective analyses allowed us to evaluate the robustness of the findings and to make comparison with the different study designs in the literature. We also examined the correlates of breakfast frequency, including demographic, dietary, and psychosocial (weight-related) factors that may be confounders or mediators of any breakfast–weight change association.

STUDY POPULATION AND DESIGN

The overall study population and study design have been reported previously.[42,43] Briefly, 4746 students in public middle and high schools in the Minneapolis/St Paul, Minnesota, metropolitan area participated in Project EAT, a comprehensive study designed to examine eating patterns and weight concerns among adolescents. A diverse array of socioeconomic and ethnic backgrounds was represented among the 31 school communities that participated in the study. The Project EAT-I survey, a 221 item self-report instrument assessing a range of socioenvironmental, personal, and behavioral factors; the Youth and Adolescent Food Frequency Questionnaire; and anthropometric data were collected from students in classrooms during the 1998–1999 school year. Surveys were completed under the direction of trained research staff, and height and weight at baselines were measured by research staff within a private area of the school. Survey development was guided by focus group discussions with youth, a theoretical framework based on social cognitive theory, and a thorough review of the literature to identify existing instruments.[44] The survey was pilot tested several times and went through multiple revisions. Five years later (2003–2004), Project EAT-II, a longitudinal follow-up study of Project EAT-I, resurveyed all of the original participants via mail to assess changes in eating patterns and weight status. Of the original population, 1074 were lost to follow-up for Project EAT-II. Of the remaining participants, 1154 did not complete the Project EAT-II survey, and 296 surveys were missing data. Characteristics of those who did complete the Project EAT-II survey were more likely to be white females from a high socioeconomic status (SES). In total, the sample size for these analyses was 2216 participants (1007 boys and 1215 girls). The mean age of all of the study participants at time 1 was 14.9 ± 1.6 years and at time 2 was 19.4 ± 1.7 years. The racial background of the participants was as follows: 63.1% white, 9.9% black, 17.7% Asian, 3.8% Hispanic, 2.7% Native American, and 2.85% mixed or other.

Measures

Breakfast frequency was assessed with the question, "During the past week, how many days did you eat breakfast?" Responses included never, 1 to 2 days, 3 to 4 days, 5 to 6 days, and every day. If this question was not answered on the Project EAT-I or II survey, the participant was excluded from these analyses.

Dietary intake was assessed with the 149-item Youth and Adolescent Food Frequency Questionnaire (YAQ). Validity and reliability of the YAQ have been tested among a random sample of children (aged 9–18 years) of participants in the Nurse's Health Study and were found to be within acceptable ranges for dietary assessment tools.[45,46] Energy and nutrient intakes were assessed with the YAQ via analysis of dietary intake of energy (kilojoules), fiber (grams per 4184 kJ [1000 kcal]), cholesterol (grams), percentage of total diet from carbohydrates, and total fat, further broken down into saturated, polyunsaturated, and monounsaturated fats. We also considered the following breakfast-specific food groups (assessed by the YAQ) to be potential mediators of the breakfast-obesity link, although they could be confounders: cereals, milk, fruit juice, breads, donuts or rolls, eggs, pancakes, and fruit. For purposes of these analyses, exclusionary criteria for this survey included those whose daily energy intakes reflected <1673.6 kJ (<400 kcal) or >29 288 kJ (>7000 kcal) and those who did not complete the YAQ at time 1 or time 2.

Weight-related concerns and perceptions (ie, weight-loss practices and perceptions or being teased about weight) were assessed via the Project EAT survey. These were considered upstream factors on the causal pathway with the potential to influence breakfast habits. Trying to lose or maintain weight over the past year was assessed with the questions, "During the past year, have you done any of the following to lose weight or keep from gaining weight?" (selections included exercise, ate very little food, and skipped meals, with a yes or no response) and "I sometimes skip meals since I am concerned about my weight," with responses including (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly agree. Currently trying to lose weight was assessed with the question, "Are you currently trying to: (1) lose weight, (2) stay the same weight, (3) gain weight, or (4) I am not trying to do anything about my weight?" Chronic dieting was assessed with the question, "How often have you gone on a diet in the last year? By "diet" we mean changing the way you eat so you can lose weight," with responses including (1) never, (2) 1 to 4 times, (3) 5 to 10 times, (4) >10 times, and (5) I am always on a diet. Additional questions with the potential to impact weight-related behaviors included, "Have you ever been teased or made fun of by other kids because of your weight (yes/no)?" and "I am too rushed in the morning to eat a healthy breakfast," with responses ranging from strongly disagree to strongly agree.

Other behaviors with the potential to influence breakfast habits were also examined. Specifically, smoking and alcohol behaviors were identified and assessed by the question, "How often have you used the following during the past year (12 months): cigarettes, beer, wine, and hard liquors?" with responses ranging from never to daily.

Physical activity, another potential confounder, was assessed with the question, "In a usual week, how many hours do you spend doing the following activities?" categorized into strenuous, moderate, and mild exercise. More than 10 examples of specific activities were given after each question. Possible responses ranged from 0 to ≥6 hours per week. Questions on physical activity and sedentary behavior included in Project EAT-I and EAT-II surveys were developed from survey items validated previously and similar to those used in national surveillance systems.[48] The questions on physical activity were adapted specifically from the widely used Godin Leisure-Time Exercise Questionnaire[49,50] and Planet Health Surveys.[51]

BMI values were calculated according to the formula: weight in kilograms divided by the square of height in meters (kg/m^2). BMI was based on self-reported height and weight measures at times 1 and 2. However, at time 1, height and weight were also directly measured by trained research staff using standardized equipment and procedures. Self-reported and directly measured height and weight were found to be highly correlated ($r \geq 0.85$).[51]

TABLE 1 **Breakfast Frequency by Gender**

Time Point	Breakfast Frequency, %		
	Daily	Intermittent	Never
Baseline (1999)			
Girls	27.2	56.5	16.4
Boys	37.9	49.1	13.0
Time 2 (2004)			
Girls	21.2	65.0	13.8
Boys	21.1	60.0	18.9

For baseline, $n = 764$ for daily frequency, $n = 1152$ for intermittent, and $n = 300$ for never; for time 2, $n = 497$ for daily, $n = 1390$ for intermittent, and $n = 329$ for never.

Sociodemographic characteristics, including age, gender, ethnicity or race, and SES, were self-reported at time 1. The prime determinant of SES was parental education level defined as the highest level of educational attainment of either parent. An algorithm was developed that also took into account family eligibility for public assistance, eligibility for free or reduced-cost school meals, and employment status of the mother and father.[52] At time 2, ascertainment of SES based on these same criteria was not repeated, because many of the participants were still of school age.

Statistical Analysis

SAS 9.1 (SAS Institute, Inc, Cary, NC) was used for all of the analyses. Breakfast frequency was recoded to 3 categories to make clear comparisons among daily breakfast eaters (referred to throughout as "daily"), irregular eaters (1–6 days per week, "intermittent"), and daily skippers ("never"). For descriptive purposes, unadjusted (or age-adjusted) associations between covariates and breakfast categories were examined using χ^2 tests or simple linear regression models. Multivariable linear regression (SAS PROC GLM) was used to examine the association between breakfast categories (independent variable) and BMI at times 1 and 2 for cross-sectional analyses. For the prospective analyses, the dependent variable was time 2 BMI, with time 1 BMI as a covariate. In model 1, we adjusted for potential confounders including age, gender, SES, race, smoking, alcohol, baseline BMI, and physical activity. Gender was treated as a covariate, because the association between breakfast frequency and BMI was similar between boys and girls ($P >$ .30 for breakfast × gender interaction). In model 2, we adjusted for dietary factors that may be confounders or mediators of the breakfast-BMI association, including energy and macronutrient intake, fiber, and the breakfast-specific food groups. Finally, in model 3, weight-related concerns and perceptions identified as possible upstream determinants of breakfast frequency were added.

RESULTS

Subject Characteristics

At time 1, the greatest percentage of study participants ate breakfast intermittently (56.5% and 49.1%, girls and boys, respectively; Table 1). Those individuals who never

TABLE 2 Time 1 Correlates of Breakfast Habits					
Variable	Breakfast Frequency				
	Daily ($n = 764$)	Intermittent ($n = 1152$)	P	Never ($n = 300$)	P
Age, y, mean ± SD	14.7 ± 1.6	14.9 ± 1.6	<.01	15.3 ± 1.5	<.01
Race, white, %	59.3	48.6	<0.01	45.2	<.01
SES, highest, %	22.2	11.4	<.01	7.0	<.01
Physical activity, high strenuous, %	26.5	18.5	<.01	16.1	<.01
Alcohol, weekly, %	2.7	6.3	<.01	13.4	<.01
Smoking, daily, %	4.6	10.9	<.01	18.4	<.01

All of the P values represent comparisons with the daily group.

ate breakfast were more likely to be girls (16.4%) than boys (13.0%; $P = .03$), whereas those who ate breakfast daily were more likely to be boys (37.9%) than girls (27.2%; $P < .0001$). The greatest change over time was observed in boys, where there was a 16.8% decrease from time 1 to time 2 in the participants who ate breakfast daily, such that at time 2 there was no difference in the prevalence of daily breakfast by gender ($P = .96$).

At time 1, when age was examined by breakfast category, those who ate breakfast daily were younger (14.7 ± 1.6 years), whereas those who never ate breakfast were older (15.3 ± 1.5 years; Table 2). In all of the participants, those who ate breakfast daily were more likely to be white, to come from a higher SES, and to engage in higher levels of physical activity. Dietary factors by frequency of breakfast consumption are shown in Table 3. In girls, the overall diet of daily breakfast eaters was higher in total energy (kilojoules), fiber (grams per 4184 kJ [1000 kcal]), and cholesterol (grams), compared with those who were intermittent or never eaters. In boys, statistically significant differences by breakfast frequency were observed for dietary carbohydrate and fiber (higher for daily breakfast) and for the percentage of calories from saturated fat (lower for daily breakfast). In both genders, strong inverse associations were observed between the prevalence of weight-loss practices and perceptions and breakfast frequency (data not shown).

Cross-Sectional Analyses

At time 1, shown in Table 4, compared with daily breakfast eaters, a higher BMI was observed in those who ate breakfast intermittently or never. Similar associations were observed at time 2 (Table 4). The inverse associations between breakfast frequency and BMI remained largely independent of all confounding and dietary factors and were similar for boys and girls ($P > .10$ for gender × breakfast interaction). Weight-related factors (concerns, behaviors, and social pressures) seemed to explain little, if any, of the breakfast-BMI association.

Prospective Analyses

The association between time 2 breakfast frequency and 5-year change in BMI, adjusted for time 1 breakfast, time 1 BMI, age, and gender, is shown in Fig 2. The frequency of eating breakfast was inversely associated with BMI in a dose-response manner ($P < .01$). Further adjustment for confounding and dietary factors did not seem to explain the association (Table 5). However, adjustment for weight-related variables (concerns, behaviors, and social pressures) seemed to partly explain this association.

DISCUSSION

We examined cross-sectional and prospective associations between breakfast frequency and weight gain in a large diverse sample of male and female adolescents in the Minneapolis/St Paul, Minnesota, area. In cross-sectional analyses, the frequency of eating breakfast was inversely associated with BMI in a strong dose-response manner. In prospective analyses, the frequency of eating breakfast was also inversely associated with weight gain in a dose-response manner. In both cross-sectional and prospective analyses, dieting and weight-control behaviors were inversely associated with frequency of breakfast consumption, suggesting that adolescents may resort to unhealthy eating habits (ie, skipping breakfast) in an effort to control body weight. Our findings are consistent with a number of other observational studies, as discussed below, although few previous studies were large

TABLE 3 Dietary Factors by Breakfast Frequency					
Dietary Factors	Breakfast Frequency				
	Daily ($n = 764$), Mean ± SE	Intermittent ($n = 1152$), Mean ± SE	P	Never ($n = 300$), Mean ± SE	P
Girls					
Joules	8975 ± 222	8138 ± 155	<.01	7301 ± 293	<.01
Carbohydrate, %	57.3 ± 0.4	58.0 ± 0.3	NS	58.1 ± 0.5	NS
Fiber, g/4184 kJ	8.5 ± 0.1	8.0 ± 0.1	<.05	7.5 ± 0.2	<.01
Cholesterol, g	220 ± 6.4	199 ± 4.5	<.01	166 ± 8.4	<.01
Saturated fat, %	10.2 ± 0.1	10.1 ± 0.1	NS	10.3 ± 0.2	NS
Boys					
Joules	9632 ± 234	9217 ± 205	NS	8858 ± 414	NS
Carbohydrate, %	57.0 ± 0.3	56.1 ± 0.3	<.05	56.0 ± 0.6	NS
Fiber, g/4184 kJ	7.6 ± 0.1	7.3 ± 0.1	<.05	7.0 ± 0.2	<.05
Cholesterol, g	236 ± 7.2	248 ± 6.4	NS	243 ± 12.9	NS
Saturated fat, %	10.4 ± 0.1	10.8 ± 0.1	<.05	10.8 ± 0.2	NS

Values are adjusted for age. All of the P values represent comparisons with the daily group. NS indicates not significant; 4.184 J = 1 cal.

TABLE 4 **Time 1 and 2 Breakfast Frequency and BMI**

	Breakfast Frequency				
	Daily, Mean ± SE	Intermittent, Mean ± SE	*P*	Never, Mean ± SE	*P*
Time 1					
Model 1	21.7 ± 0.16	22.5 ± 0.12	<.01	23.4 ± 0.24	<.01
Model 2	21.8 ± 0.17	22.4 ± 0.13	<.01	23.3 ± 0.26	<.01
Model 3	21.9 ± 0.17	22.4 ± 0.13	<.05	23.0 ± 0.26	<.01
Time 2					
Model 1	23.4 ± 0.22	24.3 ± 0.13	<.01	24.6 ± 0.25	<.01
Model 2	23.3 ± 0.23	24.3 ± 0.13	<.01	24.6 ± 0.27	<.01
Model 3	23.7 ± 0.23	24.2 ± 0.13	<.05	24.4 ± 0.26	<.05

Values are for BMI (kg/m^2). All of the *P* values represent comparisons with the daily group. Model 1 was adjusted for baseline breakfast, age, gender, race, SES, exercise, and cigarette and liquor use. Model 2 was adjusted for variables in model 1 plus total calories, carbohydrates, and fiber; percentage of total calories from fat; and individual food items including milk, cold cereal, juices, and wheat bread. Model 3 was adjusted for variables in model 2 plus psychosocial variables, including being too rushed to eat, dieting in the past year, skipping meals to control weight, concern about current weight, being teased about weight, skipping meals, and eating little in the past year to control weight.

TABLE 5 **Breakfast Frequency and Change in BMI**

	Breakfast Frequency				
	Daily, Mean ± SE	Intermittent, Mean ± SE	*P*	Never, Mean ± SE	*P*
Model 1	1.6 ± 0.16	2.0 ± 0.09	<.05	2.2 ± 0.19	<.05
Model 2	1.6 ± 0.17	2.0 ± 0.09	NS	2.2 ± 0.20	<.05
Model 3	1.7 ± 0.17	1.9 ± 0.09	NS	2.2 ± 0.20	NS

Values are for change in BMI (kg/m^2). NS indicates not significant. All of the *P* values represent comparisons with the daily group. Model 1 was adjusted for time 2 baseline breakfast and BMI, age, gender, race, SES, exercise, and cigarette and liquor use. Model 2 was adjusted for variables in model 1 plus total calories, carbohydrates, and fiber; percentage of total calories from saturated, polyunsaturated, and monounsaturated fat; and individual food items including milk, cold cereal, juices, and wheat bread. Model 3 was adjusted for variables in model 2 plus psychosocial variables, including being too rushed to eat, dieting in the past year, skipping meals to control weight, concern about current weight, being teased about weight, skipping meals, and eating little in the past year to control weight.

and prospective. We submit that breakfast habits may be important markers of an overall healthful lifestyle pattern in youth and that frequent breakfast consumption may impart important weight-gain prevention effects; additional experimental evidence should be sought in this regard.

Recent publications from large epidemiologic studies[19,20] and cross-sectional surveys[8,53] have revealed marked declines in the frequency of breakfast intake throughout adolescence. In fact, recent analysis of National Health and Nutrition Examination surveys from 1971 to 2004 found breakfast skipping to be 1 of 3 critical factors that may contribute to obesity in youth, especially among low-income and minority youth.[53] Results from the present study support these findings in that those who skipped breakfast on a daily basis had a higher BMI, were older, nonwhite, and from a lower SES. We also found that girls were more likely to skip breakfast than boys, which has been reported previously in the literature.[54]

In the present study, we found that breakfast eaters consumed greater amounts of energy, carbohydrates, and fiber but lower percentages of total calories from saturated fat. Daily breakfast eaters also seemed much more physically active than breakfast skippers. Observational studies have documented that regular breakfast consumers have favorable dietary profiles (eg, higher fiber and micronutrient intakes) and a higher total daily intake of energy,[3–6,10,23,24] carbohydrate,[3,6] protein,[3,4,6,10,23,24] and fiber[6,10,25,26] relative to breakfast skippers.[3–6,10,23–25,27] Total fat[3,27] and saturated fat[6] as percentages of total daily energy tend to be lower in breakfast eaters compared with skippers.[4,6] This dietary profile has the potential to improve energy balance and weight control, because consumption of fiber-rich foods (ie, breakfast cereal and breads) may improve glucose and insulin parameters[35–37] and lead to increased satiety[38–41,55] and lower body weight.[55,56]

An inverse association between breakfast frequency and BMI has been documented in numerous cross-sectional studies.[8–15] Our data at times 1 and 2 demonstrate a significant inverse association between breakfast frequency and BMI. When confounders and other factors (ie, dietary behaviors and weight-related concerns, behaviors, and social pressures) were added to the model, the inverse association between breakfast frequency and BMI remained or was only slightly weakened. To our knowledge, only 3 prospective studies examining an association between breakfast habits and body weight have been conducted in children and adolescents to date.[19–22] In the Growing Up Today Study, self-reported data on height, weight, breakfast frequency, and energy intake were collected in 14 000 boys and girls aged 9 to 14 years.[21] Overweight breakfast skippers had lower BMIs over time when compared with overweight breakfast eaters ($P = .01$), whereas normal-weight breakfast skippers had higher BMIs over time when compared with normal-weight breakfast eaters. Interestingly, when these same data were analyzed cross-sectionally, results indicated that, overall, breakfast skippers were heavier. Data from the National Heart, Lung, and Blood Institute Growth and Health Study document that increasing days eating the breakfast meal are predictive of a lower BMI when adjusted for basic demographics ($P < .05$) but not when parental education, energy intake, and physical activity were taken into account ($P = .38$).[19,20] When examining our data prospectively, we found that breakfast frequency was inversely associated with change in BMI in a dose-response manner.

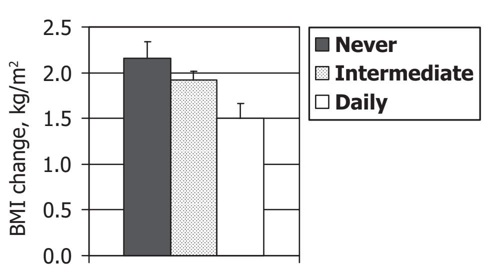

FIGURE 2
Time 2 breakfast and BMI change (adjusted for baseline BMI and breakfast category, age, and gender).

Previous publications from Project EAT have examined weight-related concerns and disordered eating behaviors among this population.[42,43,57] Unhealthy weight-control behaviors (ie, skipping meals) were present in 57% of adolescent females and 33% of males.[42] Furthermore, a direct association was observed between weight status and most of the weight-related behaviors, with greater risk observed in the overweight adolescents. This suggests that adolescent boys and girls may use unhealthy weight-control behaviors, in an attempt to control their weight, that place them at increased risk for weight gain. In the present study we observed that weight-related concerns, behaviors, and social pressures may partly explain the prospective association between breakfast intake and body weight change, an observation consistent with the hypothesis that many youth, especially girls, may skip meals in a vain attempt to lose weight.

Our study has a number of strengths, as well as some weaknesses. First, the study design of Project EAT allowed for the examination of 5-year longitudinal associations between breakfast habits and change in BMI. Second, a major strength of this study was the inclusion of both dietary and psychosocial variables, allowing for examination of various pathways that may be involved in the breakfast habit-BMI association. Lastly, this large, diverse sample of adolescent boys and girls will allow for comparison with findings in other populations of adolescents. Because there are few longitudinal studies examining this association, the present study adds important findings to the literature that may aid in the design of future studies. Study limitations include the self-reported nature of the data for exposure, as well as outcome variables, which we believe may bias the associations toward the null hypothesis because of nondifferential misclassification. However, misclassification may be negligible in that self-reported height and weight have been found to accurately classify obesity status in teenage individuals.[58] It is also possible that measurement error in the potential confounding or mediating variables may have biased associations away from the null. That is, we believe that we may be underestimating the true effect of breakfast habits on body weight. Finally, a causal link between breakfast habits and BMI cannot be determined, because the present study was observational in nature. Only future experimental studies will be able to definitively address the efficacy of breakfast frequency on body weight regulation.

CONCLUSIONS

As rates of breakfast consumption decrease throughout adolescence and into adulthood, the impact of regular breakfast consumption on public health may be significant. More emphasis should be placed on breakfast habits, especially among adolescents and young adults, when behavioral patterns are developing and stabilizing. One venue that may be appropriate for interventions is the school setting. Interventions should be aimed at promoting a healthful breakfast (eg, whole grain cereals, low-fat milk, and fresh fruit), because diets including nutrient- and fiber-rich carbohydrates have been shown to lead to weight loss and reduce disease risk. Interventions could promote the ease and practicality of the breakfast meal, which can be eaten at home, school, or work. Long-term studies including these types of interventions will be needed to evaluate the possibility of an important causal link between breakfast consumption and risk for obesity and chronic diseases, as well as for implementing generalizable community-based programs.

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